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On the Progressive Compression of Water with High Degrees of Force, with some Trials of its effects on other Fluids. By J. Perkins, Esq.

The instrument with which Mr. Perkins made the experiments of which we propose to give an account, was constructed with much care, and attention, and is described with great minuteness, in the *Philosophical Transactions* for 1826, p. 541. The water was placed in a glass piezometer, consisting of an elongated bulb, nearly four inches long, and about three-fourths of an inch in diameter, and terminating in a tube of regular bore, nine inches long, and about one-eighth of an inch of internal diameter. By weighing the quantity of quicksilver contained in this instrument, when full, and ascertaining the weight contained in a given length of the tube above, it was found that the whole content was equal to a tube of 190 inches long, having the diameter of the contracted part of the piezometer. In the bottom of the piezometer, is a small disk of steel, and above it, a delicate hair spring, of sufficient strength, to retain its position, after being pressed upwards on the tube, so as to serve as a register, of the degree of compression that has been effected. The piezometer is now filled with water, and with its register and disk, it is placed in a phial containing a small quantity of quicksilver. It is next placed in the receiver of the compressing press, and after the proper pressure has been applied the piezometer is removed, and the indicating spring is found raised in the tube, more or less, according to the power employed.

The greatest amount of which this apparatus admitted, was 1000 atmospheres, being equal to 14,000 pounds to the square inch. With this apparatus, Mr. Perkins obtained the following results, which are the means that we have calculated from his tabular numbers. The

column of water is 190 inches, and the numbers in the tables are the compression produced by the number of atmospheres around.

Atmospheres.	Compression. Inch.	Atmospheres.	Compression. Inch.	Atmospheres.	Compression. Inch.
10	0.189	80	1.187	500	5.087
20	0.372	90	1.288	600	5.907
30	0.543	100	1.422	700	6.715
40	0.691	150	1.914	800	7.402
50	0.812	200	2.440	900	8.243
60	0.956	300	3.339	1000	9.002
70	1.056	400	4.193	2000	15.833

If we make the number of atmospheres the abscissa of a curve, and the compressions, its ordinates, it will be found that the curve approximates to a hyperbolic one.

In order to estimate higher degrees of compression, Mr. Perkins constructed another piezometer eight inches long, ground internally perfectly cylindrical, and stopped at its upper extremity, with a flat disk of glass cemented into it. This tube he filled with water, and subjected it to a pressure of 2000 atmospheres. After repeating this experiment a great number of times, the average result was, that *the column of water,* EIGHT *inches long, was compressed two-thirds of an inch or one-twelfth of its length.* If we reduce this result to the scale of the preceding table, we shall find it to be 15.833, as there inserted.

With the same apparatus Mr. Perkins made experiments on the compression of other fluids. The most remarkable result he obtained, was with *concentrated acetic acid,* which, after compression, with a force of 1100 atmospheres, *was found to be beautifully crystallized,* with the exception of about one-tenth part of fluid, which, when poured out, was only slightly acid.

He next applied his apparatus to the compression of æriform fluids. For this purpose a gasometer was filled half full of water. It was then inverted and placed in a receiving tube, and it was found, under a pressure of 500 atmospheres, *that the whole of the air was taken up by the water, but none of it was given out* when the pressure was removed.

As it might be supposed that even glass was pervious to water, by such a force, a small phial was made air-tight by fitting into its neck, a well ground glass stopper. It *sustained a pressure of* 500 *atmospheres without change, and was perfectly dry within,* although it remained fifteen minutes under that pressure. When subjected to a pressure of 800 atmospheres, it was crushed to atoms.

During these experiments Mr. Perkins observed the curious fact, *that the air began to disappear* at a pressure of 500 atmospheres, a circumstance which he attributes to its *partial liquefaction.* At an increased pressure of 600 atmospheres, the quicksilver was suspended about one-eighth of the volume up the tube or gasometer; at 800 atmospheres, it remained about one-third up the tube; at 1000

atmospheres, two-thirds up the tube, and small globules of liquid began to form about the top of it; at 1200 atmospheres the quicksilver remained three-fourths up the tube, *and a beautiful transparent liquid was seen on the surface of the quicksilver, in quantity about* $\frac{1}{2000}$ *part of the column of air.*

The gasometer was now charged with carburetted hydrogen, and placed in a mercury bulb, with its mouth immersed in quicksilver. It was subjected to different pressures, and *it began to liquefy at about* 40 *atmospheres, and at* 1200 *atmospheres the whole was liquefied.*

Mr. Perkins is now occupied with the construction of a suitable apparatus for ascertaining the law of condensation of gaseous fluids, at high degrees of pressure. [*Brewster's Journal.*

On the Method of Striking the Medallions, termed by the French "En Cliché."—By Thomas Gill, Esq.

Our readers must have frequently seen the beautiful impressions, or medallions, from the Revolutionary, Napoleon, and other medals, struck during the late wars with France, and which were usually bronzed, mounted into the lids of snuff-boxes, and defended from injury, by being covered with convex glasses.

We have lately been highly gratified, by being permitted to witness the fabrication of these medallions; and from the information we then received, and particulars derived from other sources of intelligence, we trust to be able to furnish such an account thereof, as will enable others to imitate them.

It is a fact, that, either from a medal struck in any of the usual metals, from a *soft* steel die, or even from one of these medallions themselves, dies may be readily made, each of which will be capable of striking a considerable number of such medallions, and each of these, in its turn, be capable of producing a multitude of other dies, likewise fit to become the origin of as many successive medallions, and dies; so that, by this means, the original medal may be copied almost *ad infinitum!* Each remove from the original however, losing, of course, something of its sharpness, and accuracy of finish, although much less than might be supposed, and far less than by the usual methods of copying medals, by moulding and casting them.

We cannot but be surprised that so valuable an art, should hitherto, in this country, have remained in so few hands; as, from the succeeding details, it will be found to be abundantly simple, and easy to execute.

Of the metal used in forming the Dies and the Medallions.

This metal is composed of the ordinary *type metal,* which is an alloy of lead, and regulus of antimony, to which is added more and more lead, until on trial, by repeatedly breaking a plate cast from the mixture, it is found to bend a little, before breaking. This is one of the best criterions to judge by, as, from the variety of proportions of lead and regulus employed by different type-founders, no certain proportions can

be anticipated, in the composition of the *broken types*, which are purchased for this use.

This compound metal is made, and melted, in a cast-iron pot, such as is used in cooking, and which is suspended over the fire, by its bail, or handle. The alloy, when a small quantity of it is taken up in an iron ladle, and kept in continual motion by shaking the ladle round and round, whilst it is cooling, at length assumes *a pasty consistence*, or a commencement of crystallization: this is the proper moment for employing it, either to form a die, or a medallion, by striking the original medal, or medallion, or a die upon it, in the manner to be hereafter described; when, from its pasty coherence, it cannot slip away from the blow, and is yet sufficiently plastic to receive the impression of the medal or die.

The compound metal, at the above period, does not retain heat enough to singe, or even to discolour the paper upon which it is laid, to receive the impression; and this again forms another valuable criterion to judge by, whether the alloy is rightly proportioned or not.

It would hardly be thought that this alloy, or composition, should be capable, both of forming the die or mould, and also of yielding numerous impressions from it, and yet such is the fact: a most remarkable discovery, and one, indeed, upon which the great merit of the art chiefly rests.

Type metal may consist of about five parts of lead, and one of regulus of antimony. The lead being melted in an iron vessel, the regulus must be stirred in it, continually, and be kept immersed in the lead, until it is at length dissolved, or melted in it: this, however, is a work of time, and very much depends upon the *due heat* given to the lead, which ought to be a little, though not much, above its melting point, lest it oxidate. The surface of the lead ought also to be covered with rosin, pitch, or grease, to prevent such oxidation as much as possible. The goodness of the type metal depends very much upon the quality of the regulus which enters into its composition. This metal, contains more or less *iron** or tin, (from the clippings of tinned iron plates being generally preferred, in this country, for making the regulus from the ores of antimony.) *Copper*, when used, particularly fits it for making a *whiter pewter*, than the regulus made with iron. We have seen, recently, a very superior kind of regulus, nearly free from any admixture with either of those metals; so that the nature of the type metal, as we have before said, is infinitely various.

These impressions are also taken, by the French, in what they term "*Darcet's alloy*," but which we know under the name of *Sir Isaac Newton's fusible metal*, being a compound of three parts of tin, five of lead, and eight of bismuth, and capable of melting in boiling water. This metal, although more expensive, is harder than that above described, and is capable of giving exceedingly sharp impressions. A still better metal would however, be, *G. Smith's solder for tin*, as it is not so liable to crystallize in cooling, as the fusible metal;

* See an article by Mr. Gill, on alloys of cast-iron, with lead, tin, and regulus of antimony.—Vol. II. p. 374.

this is composed of one part each, of lead and tin, and two parts of bismuth.

On the machines employed for Striking the Dies and Impressions.

The well known button stamp may be used; but the one we saw, had only a single, square, iron rod, or stem, guided above in two square halved holes, and having a ring handle to raise it by. This apparatus was mounted upon the top of a three-sided close box, like a corner cupboard, set upon the floor, with a door opening in front; the rod passed through a hole made in the top of the box, and had appended to it, a brass, or gun-metal frame, having four screws on the under side of it, passing through, made in as many ears formed in the frame, exactly like the ordinary die dish, employed to hold dies, &c. in the lathe, in order to turn them. These screws crossed at right angles, their points all tending to the centre of the frame, which was made quite flat on its under side. A soft bell-metal, or gun-metal, cylindrical ring, was held, or suspended, between the four screws, and it also contained an inner gun-metal ring of the same depth as the former, but its inside was made in the shape of two inverted cones, the use of which will be hereafter described. The inner ring was held fast, by means of a single screw fixed in the outer ring, binding upon it. The frame had also a groove made around the upper, or cylindrical part of it, into which a catch, or detent, was fitted, which was mounted upon an axis in the centre, and its other, or outer end, was shaped into an inclined plane, hanging over the door of the box, and so contrived, that, instantly, on shutting the door, the detent was raised, and let the frame fall. The bottom of the box had a flat plate of cast-iron laid upon it, to support a tray of paper in the middle of it, and upon which the lump of heated alloy was placed, in order to receive the impressions, and the door and sides of the box were lined with sheet lead all around their lower parts, to catch the excess of metal which splashed around, from the force of the blow upon the heated metal.

Other machines of this kind have had the rapidity of the descent of the frame increased, by means of springs in the form of a bow, acting upon it.

The door of the box being opened, the detent was engaged in the groove made in the top of the frame, which also passed through the hole in the top of the box, and held it up, whilst the heated mass of metal was being laid upon the paper, but instantly released it, and suffered it to fall, upon shutting the door of the box.

We have now before us, the obverse of one of Buonaparte's medals, in the state in which it was produced from the blow. It is one and a half inches in diameter on its face, but widens behind to one inch and five-eighths, it being conical on its edge. It is one-eighth of an inch in thickness, this being intended to be reduced, by turning it away at its back, in a lathe of a peculiar construction.

We have said that the innermost of the two gun-metal rings, had its inside made in the shape of two inverted cones. The lowermost of these cones, gave the conical form to the edge, or rim, of the medallion, and was consequently one-eighth of an inch in depth. The

uppermost, or reversed cone, was formed of the same angle, but was seven-eighths of an inch deep, the thickness of the ring being one inch. The die from which this medallion had been struck, was formed by carefully filing the conical rim of a similar medallion, until it accurately fitted the lower part of the reversed cone, the face of the medallion being let into the cone, even with the line of meeting of the two cones. Some of the metallic medallion alloy, was then poured into the remaining space in the cone above the medallion, until it filled it up, exactly even with the flat surface of the ring. By this judicious contrivance, the medallion was effectually prevented from rising, in striking the blow, by means of the flat face of the alloy, thus poured in above it, coming into contact with the flat undermost face of the carrying frame; and it was prevented from falling, by the cone in which it was held. In this state, the ring, and the medallion in it, being fastened in the outer ring, by the screw in it, and a mass of the melted alloy laid upon a thick paper tray, supported upon the flat cast-iron plate below, as above described, the frame, rings, and medallion, being first raised and held up by the detent, the blow was struck upon the melted alloy, and the excess of metal being scattered on all sides; in which it was aided by four shallow gaps, filed across the flat bottom of the ring, to permit the air and extra metal to escape the more readily; upon removing the impression from the die, by means of one of the portions of metal, which filled one of these four grooves, together with the conical or widening form of the mouth of the ring, a female impression of the medallion was thus produced; which, on being, in its turn, accurately filed on its rim, so as to fit into the uppermost cone of the ring, exactly, and, as was above described in fixing the medallion into it, and the space above it being also filled with melted metal, thus formed the die, from which our medallion was struck, and was evidently capable of striking many such. We have to add, that, although the outer ring was capable of receiving within it, other rings, of one uniform external diameter, that the inside cones of which were fitted to many different sized medallions, yet that various sizes of outer rings were also provided, in order to extend the capability of the apparatus to strike the larger medallions also.

Two differently fitted up lathes, were employed in this manufacture. The one, to turn the conical rims of the medallions to a cylindrical form, and to prepare them to be afterwards reduced at the other, to a proper thickness and flatness. The medallion was held central in the first lathe, by its circular border being received upon the sharp circular edge of a concave gun-metal dish, or chuck, screwed upon the lathe mandrel; which permitted the raised impression to be lodged in it, and it was pressed into contact with the dish or chuck, by a central point, urged against its back by a screw. In this situation the conical edge or rim of the medallion was readily turned cylindrical, by a tool properly held and guided in the lathe. There was afterwards little difficulty in holding these medallions, thus made cylindrical, upon their edges, in proper chucks, fitted upon the mandrel of the other lathe, and in applying a turning-tool to their backs, to turn them flat, and of a proper thickness. In case,

however, of medals being to be formed of these medallions, the two parts, forming the obverse and reverse, were first cemented together at their backs, and then placed in a third lathe, furnished with two similar concave gun-metal dishes or chucks, the one placed behind, and the other in front of the medallion, to support it; and the one of them being screwed upon the lathe mandrel, and the other having a hole in its centre, which was lodged and turned upon the conical back centre of the lathe: the double rims could thus be turned together, to a perfect cylinder.

Die Sinkers may avail themselves, with advantage, of this method of taking impressions from their *soft* dies, during the progress of their execution; and indeed we have an impression from a die of the late Mr. Johnnis, of Hafod, thus produced, by that excellent artist, the late Mr. Mills.

Large types, or blocks for printing, may also thus be multiplied, with great facility and correctness, even more so, than by stereotyping them.

We subjoin the following article, *on Bronzing these Medallions*, observing, by the way, that it is stated to be for *bronzing tin*. The French applying the term *L'Etain* indifferently both to *tin* and *pewter;* a practice which frequently leads to great inconvenience in translating from that language. [*Technical Repository.*

On Bronzing the Medallions Struck in Soft Type Metal, or Fusible Metal.—By M. VERBY, *Jun.**

To perfectly succeed in bronzing these medallions, we must employ the two following solutions: the first, which serves as a preparatory wash, to be used as hereafter described, is composed of one part of sulphate of iron, one part of sulphate of copper, and twenty parts (by weight) of distilled water.

The second solution, which is the bronze, is less complicated; it is composed of four parts of verdigris, and sixteen parts (by weight) of white French vinegar.

The Manner of Employing these Solutions.—When the medallions have been filed and polished, on their edges, and strongly rubbed with a brush, wetted with a mixture of tripoli, or rotten-stone, and water, and well washed and dried, we pass the first solution slightly over both their faces, with a hair pencil, and then wash and wipe the medallions dry; this gives them a slightly blackish colour, and causes the verdigris to adhere more quickly to them. They are then rubbed with another hair-pencil, wetted with the second solution, until they become of a deep copper colour; they are then left to dry for an hour, after which they are polished with a soft brush, and red lead, breathing upon them frequently, to slightly moisten them, and cause

* From "*Recueil des travaux de la Soc. de Lille*, 1825.

the red lead to adhere to them; the polish is lastly finished with a soft brush, alone, passing the brush from time to time over the palm of the hand. To prevent the bronzes from being attacked by humidity, they may be covered with a slight coat of gold coloured lacker.

The *cliches* made with Darcet's alloy, or fusible metal, are bronzed with the second solution only, and do not require to be varnished, to preserve them from the effects of humidity.

Note by the EDITOR.

The plumbers give their soft soldered joints, near the cocks, the appearance of copper, by wiping over them a mixture of sulphate of copper in powder, with vinegar. Might not this be applicable to the above purposes?

The above medallions are frequently bronzed by coating them with a thin layer of gold size, and then applying bronze powder with a dry hair pencil, in the usual manner of bronzing plaster figures, &c.

[*Technical Repository.*

On an excellent mode of Coating small articles of Metal, with Tin.
By THOMAS GILL, ESQ.

The Editor once witnessed the following superior mode of tinning with great economy and convenience, small articles, such as tacks, nails, &c.

The workman having previously made the surfaces of the articles clean from rust, or other oxide, by pickling them, or putting them into sulphuric, muriatic, or nitric acid, diluted with water, as usual, and washing them well afterwards in water, he put them, together with a proportionate quantity of bar, or grain tin, and of sal-ammoniac, into a stone-ware gallon bottle, having an oval body, a narrow neck, and a handle to lift it by. He then placed the vessel, lying upon its side, over a charcoal fire, made upon a forge hearth, and heated it; continually turning it round all the while, and frequently shaking it, to distribute the tin uniformly over the surfaces of the articles to be tinned. They were then thrown into water, to wash away all remains of the sal-ammoniac, and finally dried in saw-dust, made warm.

The great merit of this process, consists in the employment of the *stone-ware vessel*, which not only prevents the dissipation of the sal-ammoniac, in fumes; but also gives up the whole of the tin to the articles to be tinned, which would not be the case were a *metallic vessel* to be used. [*ib.*

ESSAYS ON BLEACHING.

By James Rennie, A. M. Lecturer on Philosophy, &c. &c. London.

No. III.—CHEMICAL AGENTS USED IN BLEACHING.

Manganese.

SECTION VI.—This substance can scarcely be reckoned a direct agent in bleaching, but as the most important agent used in the art is made from it, in an essay of this kind it would be unpardonable to omit its consideration. The best manganese is raised at Upton Pine in Devonshire, from a mine which seems adequate to the supply of the whole island for a century to come; most other kinds are of little use to the bleacher, as they require a greater proportion of sulphuric acid to saturate them, and withal, produce less oxygen. It is the black oxide of manganese which is used in the manufacture of chlorine, and it is this oxide which is procured from the mines. Besides the mines at Upton Pine, there are manganese mines at Bristol, and in Ayrshire, Aberdeenshire, and in various parts of Europe and America. That from Bristol and the Mendip hills is the worst, as it is generally contaminated with lead. The black oxide, when good, is of a bluish black colour, and shining lustre; when saturated with oxygen, it contains 44 parts of that substance, and 66 of the metal; but as it comes from the mines, it more commonly contains about 40 per cent. of oxygen, or even less. The substances with which it is most liable to be contaminated, are the oxides of lead, iron, and the carbonate of lime; and when it contains any of these, in quantity, the quantity of chlorine which it is capable of developing is proportionally less.—The carbonate of lime may be detected in the oxide of manganese, by pouring on it a quantity of nitric acid diluted with ten parts of water, when, if chalk is present, an effervescence will take place, and the lime will combine with the test liquor; while no effervescence will follow if lime is not present. In the former case, let the test liquor stand on it till it has taken up all the lime in the specimen, and then precipitate this lime by adding carbonate of potash to the solution. The weight of the precipitate will indicate the extent of the contamination. The presence of lead may be discovered by the sulphuric acid, or by Harrowgate water, with either of which it will form a dark brown or black precipitate, insoluble in water. Or take equal parts of oyster shells and sulphur, keep them in a white heat for a quarter of an hour, and when cold, add to the mixture an equal quantity of supertartrate of potash. Boil the whole in a strong bottle with rain water, for an hour, when there may be added to the liquid, twenty drops of muriatic acid for every ounce, to prevent the test from affecting any iron which may be present. This re-agent produces from lead, a black precipitate, and will detect the most minute portion of that metal.—(Watson's Chem. Ess. III.)

The ores of iron, are less easily detected in the oxide of manganese. When the iron, however, contains a proper proportion of oxygen for rendering it soluble in muriatic acid, we may thus discover its pre-

sence. By means of heat, make a solution of the oxide of manganese to be tried, in strong muriatic acid; add to the solution, a considerable proportion of distilled water, and pour into this liquid, a solution of crystalized carbonate of potash. If the manganese contains iron, it will, by this means, be precipitated in the state of an oxide, while the manganese will remain suspended by the excess of carbonic acid. Or the iron may be separated by the nitric acid, (oxymuriatic acid,) with the addition of sugar, which will combine only with the manganese.

Chlorine, (Oxymuriatic acid) and its compounds.

SECTION VII.—Next to oxygen, chlorine is perhaps the most interesting of all chemical agents. The theoretical researches to which it has given rise, are the most profound, and the least satisfactory, of all the subjects of chemistry. With this at present we have nothing to do; but we shall find its use in manufactures, and chiefly in bleaching, no less interesting, and surely more important, than the ingenious theoretical discussions which it has produced. This substance has been called an acid, but it wants one of the most marked properties of this class of bodies, namely, the conversion of vegetable blues, to red. Chlorine dissolves all vegetable colours, and renders them white; hence its use in bleaching, and its distinction from all other acids. In the gaseous form, it is of a greenish yellow colour—whence its name; and, although it supports combustion, it cannot be respired, without great injury to animal life. For the purposes of bleaching, it is made by an apparatus invented by Berthollet, and subsequently improved by Des Charmes, Fisher, and others. A description of the latest improvements in this apparatus has already been given. I shall now briefly state the process. The black oxide of manganese and muriate of soda, are mixed together in the proportion of 2 to 3, and after moistening them with water, they are wrought till the mixture is of the consistence of moist dough, in order that the manganese may unite more intimately with the salt. The mixture is perfect when it is uniformly black. In this state it is put into the retort. There is now gradually added 2 2-7 parts of sulphuric acid, which has previously been diluted with its own weight of water, and allowed to cool, in order to prevent accidents. This, immediately, without the application of heat, disengages chlorine from the mixture, in the state of gas; as soon as the quantity of gas thus disengaged, diminishes, a fire is kindled under the water-bath in which the retort is placed, and continued till all the procurable gas come over. This gas, impelled by its expansive force, passes from the retort to the large leaden receiver, where it is combined with water, with lime, or with some of the alkalies. The rationale of this process, is, that the sulphuric acid having a greater affinity than muriatic acid, for the soda of the muriate, combines with the soda, and sets free the muriatic acid, which, according to Davy, parts with its hydrogen to the manganese; according to the old theory, it attracts the oxygen of the manganese, forming chlorine gas. This gas it was which was formerly used in bleaching, pure and without admixture, but this is now, I believe, wholly laid aside,

and a combination of it with water, potash, soda, magnesia, or lime, is preferred. These it will be necessary to discuss in their order.

1. *Berthollet's Bleaching Liquor.*

The chlorine diffused through water, was the mode of using it invented by Berthollet, and still followed in some old establishments. The bleaching liquor formed in this way, may be either made of the proper strength for use at first, or it may be made stronger and more concentrated by putting a smaller quantity of water into the receiver, or a larger proportion of ingredients into the retort; in which case it can be afterwards diluted to the proper strength. When this liquor is much concentrated, it has, like the gas, a greenish yellow colour, or what Werner calls a siskin green. It has also, like the gas, a very penetrating and offensive smell, arising, indeed, from the disengagement of the gas. It cannot be breathed, even for a few instants, without the danger of a most obstinate and violent cough, and sometimes causes the workmen to fall down senseless. Asthmatic affection of the breast, headache, tears and smarting of the eyes, bleeding at the nose, pains in the small of the back, and spitting of blood, are the ordinary symptoms which its respiration induces. So that unless the most careful and unremitting attention be paid to the lutes, it is impossible, even for a strong man, to support for several successive days, so unhealthful an employment. Des Charmes (p. 65) was so much affected by the violent expectoration thus produced, that he could retain no food on his stomach; he was deprived of sleep, and exceedingly afflicted with acrid humours flowing from his nose and eyes, so that he could not bear the light, while he suffered great pain in his back and thighs. These consequences are very serious, and they soon called forth the genius of invention to contrive preventives.—One of these was to introduce carbonate of potash or soda into the water in the receiver, in the proportion of one-fourth, to one of the muriate of soda employed. Even the sprinkling of a solution of any of those carbonates upon the surface of the bleaching liquor, previously to using it, will, in a great measure, neutralize the disagreeable effluvia. By this method, however, the alkali was not only totally lost, and the expense, in consequence, greatly increased, but the detergent power of the liquid was supposed to be considerably diminished, which was attempted to be proved by Mr. Rupp of Manchester, from numerous experiments. To obviate the primary evil, and to avoid the expense of its proposed cure, he contrived a very simple apparatus for exposing the goods equally to the liquid, and preventing the escape of the noxious gas, a description of which has already been given in its proper place. The application of chlorine condensed in water, however, may now be considered as one of the nearly obsolete agents in bleaching, although it is unquestionably more powerful than any of the oxymuriates.

2. *Oxymuriate (chlorate) of Potash.*

When the simple gas, and also water impregnated with it, were mostly given up, oxymuriate of potash, or soda, came to be used, as we have already seen in the history. The preparation

of the bleaching liquor with these, is precisely similar to that employed in the impregnation of water; the leaden receiver being, in the former case, filled with a solution of one of these alkalies. The experiments of Mr. Rupp and others, to prove that the detergent power of chlorine is diminished by neutralizing it with an alkali, have been found practically erroneous. It is not unlikely, indeed, that they were deceived by the circumstance of the oxymuriates not producing so sudden an effect as the pure chlorine; but this is rather an advantage than otherwise, for the chlorine is disengaged so slowly and gradually from these salts, that time is given it to act equally and effectually on every part of the cloth. Little is lost, consequently, which is so copiously emitted by the escape of gas in the former case; and the operation is also rendered more healthy to the workman.—Lately, the combination of chlorine with the mineral alkali, has been much used in the calico manufacture, for clearing the whites of maddered goods, and it has almost superseded the tedious and expensive process of crofting. It is used in a state of great dilution, for although a strong solution would clear the whites more rapidly and more effectually, yet care must be taken not to make it strong enough to affect the colours which are to remain fast on the piece.

The strictest attention ought to be paid to the purity of the alkali used for making oxymuriates, as, if it be contaminated with neutral salts, the chlorine is not all taken up, and that which is left in an uncombined state, being greatly stronger than that which unites with the alkali, it will attack the colours of the printed goods, and in all probability discharge them.

8. *Oxymuriate (chlorate) of Magnesia.*

Sir Humphrey Davy found by experiment that the texture of linen was considerably injured when immersed in a hot solution of chlorine and water, by the corrosion, as he supposes, of the muriatic acid. Now this, he justly thinks, decreases considerably the advantage of the speedy and effectual bleaching which is thus produced. To remedy this, he instituted a set of experiments, and was so fortunate as to discover a substitute wholly free from this inconvenience, namely, the oxymuriate of magnesia. This may be procured by the method already described, by diffusing the magnesia through the water in the receiver, with which the chlorine combines and becomes condensed. It acts much more slowly and gradually than any of the other compounds of chlorine employed for the same purpose, and, consequently, must produce a more equal detergency. At Sir Humphrey's suggestion, it was employed to some extent for clearing the whites of printed calicoes in the large establishment of Mr. Duffy of Dublin, and with great success; for it was not found to injure, in the least, even reds and yellows, which had been fixed by mordaunts, while the oxymuriate of lime not only changes all the colours, and renders them of a duller hue, but also particles of the lime attach themselves so intimately to the cloth, that it acts as a discharge, and effaces the colours altogether. The oxymuriate of potash again, although not so strong an alterative, changes red to

pink, and gives to purple, and lilac, a bluish shade; the alkali always diminishes the intensity and brilliancy of all colours. The oxymuriate of magnesia seems free from these imperfections.

Sufficient quantities of magnesia can be procured for this purpose from sea-water, or from the residual liquor of salt works; and perhaps the act which grants a drawback on salt to the makers of chlorine, (38th Geo. III. c. 89, s. 89,) may be found to extend to this use of sea-water; or, if not, a similar act may be procured, to pass when the advantage becomes manifest. It is not unlikely, if the oxymuriate of magnesia shall come into general use, that a similar method will be taken to manufacture it in the dry state, as is now successfully practised with respect to the oxymuriate of lime, in order to facilitate its conveyance to a distance.

ON HOUSE PAINTING.

[Continued from page 367. vol. 3.]

King's White derives its name from the use of it in the apartments of the French king. It is in all respects conducted like the former, except that there is only a small quantity of indigo, to take the yellow from the white, without any black of charcoal, and without varnish.

This white answers extremely well for apartments which are seldom used; but otherwise it spoils easily, especially in bed-chambers. It is the best white where there is any kind of gilding: and in this case, it may receive a little varnish.

The disagreeable smell perceived on entering rooms newly painted in distemper, is universally known. It is only after having left these rooms exposed to the action of the air, that they are habitable. A process which remedies these two inconveniences, deserves therefore to be adopted, and it is with that view that it has been published by M. Carbonell, a Spanish Physician.

The mode of operation described by the author, is very simple; it consists in substituting the serum of the blood of animals, instead of the solution of glue or size, commonly used to mix up the colouring matter.

To succeed, the following methods must be used:

1st. The butcher must be directed to receive the blood of one or more oxen in proper vessels. When the blood is quite cold, that is to say, three or four hours after it is drawn, the vessels must be gently inclined, by which means, a clear amber-coloured liquor will be decanted. This must be passed through a strainer to separate the impure fragments which have broken off and been mixed with it.

2d. Reduce to powder quick lime, which has been sprinkled with a little water to diminish the adhesion of its integrant parts. Pass this powder through a sieve, and deposit it immediately in boxes or bottles, well closed.

3d. When these two materials are to be used, the serum is first poured into a wooden or earthen vessel, and mixed with a sufficient quantity of lime, pulverized as directed above, taking care to pre-

serve the mixture of a proper fluidity to be easily spread with the brush over the surfaces to be covered.

4th. Too great a quantity of this paint must not be prepared at once; because it thickens very fast, and when it has acquired too much consistence it cannot be used. This inconvenience may, however, be remedied by keeping the fluidity at the same point, by the addition of a sufficient quantity of serum, which should always be kept in a vessel near that containing the paint, that it may be used when necessary.

5th. The colour so prepared, should be used as quickly as possible.

6th. As the colour resulting from the application of this preparation is always white, and as there are circumstances in which a different colour is wished for, this may be obtained, by adding a bolar earth of a red, black, green, or yellow species to the serum, at the same time as the lime is mixed. Even a beautiful blue may be obtained by using the blue glass (*smalt*) prepared from oxide of cobalt, provided it be reduced to an impalpable powder.

7th. The strength of the composition being necessarily lessened by the addition of the bolar colouring matters, the same degree of solidity may be preserved by adding to the serum used for diluting this composition, a few whites of eggs; but particular care must be taken not to put too many, otherwise the paint will be subject to scale off.

8th. This paint can only be applied on wood work, or coatings of plaster, which have not been previously covered with oil-paint.

9th. As one layer will not be sufficient, two or three may be laid on those surfaces which are required to be well painted; but before laying on a second coat, that which has been already applied, must be perfectly dry.

10th. A beautiful polish may be given to the paint by friction, in the same manner as to other sorts of paint; it need only be observed, that it is better to grease the cloths used for rubbing it, with clear whale oil, rather than with any other material.

11th. To temper this paint, whether white, or coloured, it is necessary that the serum should be fresh, and not have undergone any change, otherwise the paint will be of a bad quality, and not durable.

The preservation of the serum, particularly in the summer, requires much caution, because this fluid has a great tendency to putrefy.

It is, therefore, essential to keep it in a cool place, and to examine before using it, whether it has begun to emit a bad smell; for, in that case, care must be taken not to use it. For the same reason the vessels in which the serum is kept must be carefully cleaned, and washed frequently with hot water; to remove the spoilt portions of this fluid, with which the pores of the vessels might be impregnated.

M. Carbonell asserts, that this paint is so durable, that, when prepared with good materials, it may be used to paint the walls of damp houses, without fear of its coming off; an advantage certainly not possessed by distemper painting.

The same author also asserts that he has made many experiments with this same paint, and has obtained satisfactory results; and in all cases so constant, that he doubts not, when it shall be known, that it will be generally adopted. He instances, among other ex-

amples, the use which is made of it at Barcelona, as well on the exterior of buildings, as within side, and he always observed, not only that the sun, the air, moisture, or draught, produces no change on it, but also that it is free from any bad smell; so much so, that places where it has been used, may be inhabited, without danger, the very day of its application.

We might be disposed, at the first glance, to believe that the new paint proposed by M. Carbonell, is nearly the same with that of milk, described some years ago by Cadet Devaux. This latter paint may have also succeeded; but on reflecting on the essential difference which exists between milk, and the serum of blood, it will soon be perceived that if the milk paint is good, that of M. Carbonell must be better. But experience must decide in this respect, and it is to be presumed that a short time will make known which of the two methods deserves the preference.

The work in which M. Carbonell has given the details relative to the preparation and use of his paint with serum, is dedicated to the queen of Spain. This work has been printed in the Spanish language; and it might advantageously find a place in the works of science which proceed from the press of this country.

We may now direct the reader's attention to the subject of painting in oil.

By means of oil, the colours are longer preserved; and not drying so speedily, they give painters more time to smooth, finish, and retouch their works; the colours being more marked, and mixing better together, give more distinguishable tints, and more vivid and agreeable gradations, and the colouring is more delicate.

The painting in oil consists of two kinds, namely, of that in simple oil, and of that in polished oil varnish. The following may be considered as important introductory details.

1. When bright colours, as white or gray, are ground and diluted in oil, it is adviseable to make use of the oil of walnuts; but if the colours be dark, such as chesnut, or olive, or brown, you must make use of pure linseed oil.

2. When the colours are ground and diluted in oil, they must be laid on cold, except on a new or moist plaster, which requires them to be heated.

3. Every colour diluted in pure oil, or in oil mixed with essence, ought to fall in threads from the end of the brush.

4. Take care to stir, from time to time, your colour before taking it up on the brush, that it may preserve an equal thickness, and consequently the same tone. Notwithstanding the precaution of stirring, if it is found to be thicker towards the bottom, it will be necessary to pour in, from time to time, a little oil, and thus preserve it of the same consistence.

5. In general, every subject which is painted in oil ought first to receive one or two layers of white ceruse, ground and diluted in oil.

6. When the painting is exposed to the air, as in doors, windows, and other works, which cannot be varnished, it is adviseable to make these layers with pure oil of walnuts, mixed up with about one ounce of essence to a pound of colours; more, would make the colours

brown, and occasion them to fall off in dust; but this quantity prevents the sun from blistering the work.

7. In subjects on the inside of the house, or when the painting is varnished, the first layer ought to be ground and diluted in oil, and the last, diluted with pure essence.

8. If copper or iron, or other hard substances, are to be painted, it is necessary to mix a little essence with the first layers, to make the oil penetrate into them.

9. When there are many knots in the subject, as is particularly the case with fir-wood, and when the colour does not easily make impression on these parts, it is necessary, when you paint with simple oil, to lay on a little oil mixed with litharge, on the knots. If you paint with polished oil varnish, it is necessary to apply a hard tint, which we shall have occasion to speak of afterwards. A single layer, well applied, is generally sufficient to give a body to the wood, and make the other layers apply easily.

10. There are colours, such as what the French call *stils-de-grain*, black of charcoal, and especially bone and ivory-blacks, which are difficult to dry when ground in oil. To remedy this inconvenience the following siccitives are mixed with the colours, to make them dry, viz. litharge both of the silver and gold colour, vitriol or copperas, and what is called *siccitive oil.*

It may be recommended not to mix the siccitives with the colours till they are to be employed, otherwise it will thicken them: but mix them only in very small quantities in preparations wherein there is much white lead or ceruse, because those colours are drying of themselves, especially when they are diluted in spirits of turpentine.

In painting which is to be varnished, give the siccitive only to the first layer, and allow the other layers, in which there is spirit, to dry of themselves.

In dark colours in oil, give to every pound of colours in diluting them, half an ounce of litharge; to bright colours, a drachm of white copperas ground in walnut oil.

When in place of litharge or copperas, the siccitive oil is employed, it requires a quarter of a pint of this oil to every pound of colour.

The siccitive oil is prepared of one half ounce of litharge, as much of calcined ceruse, as much of *terre d'ombre*, a colour with which the French paint shadows, and as much of talc, boiled for two hours on a slow and equal fire, with one pound of linseed oil, and stirred the whole time. It must be carefully skimmed and clarified, and the older it grows, the better it is.

Ochres and earths require more liquids both in grinding and diluting than ceruse. Different quantities of liquids are required in the grinding only on account of greater or less dryness; but in diluting, the quantity is always the same.

For the first layer after the priming, which has no relation to the colours laid on afterwards, to a square fathom give fourteen ounces of ceruse, about two ounces of liquid, to grind, and four ounces, to dilute it. If there is a second layer of the same materials, the quantities will require to be less.

It will require three pounds of colour for three layers of a square

fathom. The first may consume eighteen ounces, the second sixteen, and the third fourteen.

To compose these three pounds of colour, take two, or two and a half pounds of ground colours, and dilute them in a pint, or three half pints of oil, mixed with essence, or pure oil. But if the first layer of ceruse is not used, there will be a necessity for a greater quantity of colours.

For painting in simple oil, on doors and windows, give a layer of ceruse ground in common oil diluted with the same fluid, together with a little siccitive; then give another layer of the same preparation; to which, if you want a grayish colour, add a little black of charcoal and Prussian blue, ground also in oil of walnuts. If to these the painter be inclined to add a third layer, grind and dilute it in pure oil; observing that the two last layers be less clear, or have less oil in them, than the first; the colour in this case is more beautiful, and less apt to blister with the sun.

Walls that are to be painted must be very dry; and this being supposed, give two or three layers of boiling linseed oil to harden the plaster; then lay on two layers of ceruse, or ochre, ground and diluted in linseed oil; and when these are dry, paint the wall.

To paint tiles of a slate colour, grind, separately, ceruse and German black in linseed oil; mix them together in the proportion which the colour requires, and dilute them in linseed oil: then give the first layer very clear to prime the tiles; and make the three next layers thicker, to give solidity to the work.

To paint arbours and all kinds of garden work, give a layer of white ceruse ground in common oil, and diluted in the same oil, with the addition of a little litharge; then give two layers of green, composed of one pound of verdigris and two pounds of white lead, ground and diluted in the same manner as the first portion. This green is of great service in the country, for doors, window shutters, arbours, garden-seats, rails, either of wood or iron; and in short for all works exposed to the injuries of the weather.

To whiten statues, vases, and all ornaments of stone, either within doors, or without; first clean the subject well, then give one or two layers of white ceruse, ground and diluted in pure or refined oil, and finish with giving one or more layers of white lead prepared in the same manner.

If you wish to paint on walls not exposed to the open air, or on new plaster, give one or two layers of boiling linseed oil, and continue to brush, till the walls are fully soaked; then give a layer of white ceruse, ground in common oil and diluted with three fourths of the same oil, and one fourth spirits; and lastly, give two layers more of white ceruse, ground in oil of walnuts, and diluted in oil mixed with essence, if it is not to be varnished; but in pure essence if it is. It is in this manner that walls are painted white. If you adopt another colour, it is necessary to grind and dilute it in the same quantities of oil and essence.

To paint chairs, benches, stone, or plaster, in a superior way, give a layer of white ceruse ground in oil of walnuts, and diluted in the

same oil, into which you have cast a little litharge to make it dry; then apply a layer of the tint you fix on, ground in oil, and diluted in one part oil, and three parts essence; and afterwards give two more layers of the same tint, ground in oil, and diluted in pure essence: this may be varnished, with two layers of spirit of wine varnish.

To make a steel colour, grind separately in turps, white ceruse, Prussian blue, fine lac, and verdigris. The tone which you require is procured by the proper mixture of those ingredients. When you have fixed on the tone of colour, take about the size of a walnut of the ingredients, and dilute them in a small vessel in one part of turps and three parts of white oily varnish. *N. B.* This colour is generally made of white ceruse, of black charcoal, and Prussian blue, ground in thick oil, and diluted in essence, which is the cheapest method of procuring it; but the former, is the most beautiful.

(TO BE CONTINUED.)

ENGLISH PATENTS.

To JOHN HAM, *of Holton-street, Bristol, vinegar maker, for an improved process for promoting the action of acetic acid on lead, in the manufacturing of white lead, and also on other metallic bodies.* Dated June 13, 1826.

THE metal mentioned in the specification of this patent, on which the acid is to act, is lead, for the purpose of making white lead, or ceruse; and the acid employed is vinegar, which chemically differs considerably from acetic acid, stated in the title.* The process and apparatus for this purpose, are as follows:—

A chamber is to be prepared, whose size is not specified, but which, according to the proportions of the parts in the drawing, contains a cube, of about ten feet at every side; the bottom of this chamber, and about 12 inches in depth of the walls, are directed to be made of bricks, laid in "Roman cement," or other cement, on which vinegar will not act, which will then form a cistern, or receptacle for the vinegar, from the lower part of which a pipe proceeds horizontally, a little beyond the wall, furnished with a cock for the purpose of clearing out the spent liquor; and into the same pipe, between the cock and the wall, a vertical pipe, about 12 inches long, enters, whose use is to convey fresh vinegar into the cistern; the height that it rises in which, may be known by inspecting the depth of the liquor in this vertical pipe. Close to the bottom of the vinegar cistern, a long "*lead*" pipe is laid, so as to make several traverses at equal distances from each other, back and forwards, from side to side, (eight of which traverses are shown in the drawing,) and comes out again at the same side of the chamber at which it entered; into which long pipe, steam is made to enter at one end from a steam

* This criticism of the English Editor, is incorrect. The acid contained in vinegar, is the acetic, and it is this which is evaporated, and acts upon the lead. The water, mucilage, &c. which vinegar contains, are mixtures, which dilute, and modify the action of the acid, but do not, chemically, change its nature. [*Editor.*

boiler, while the hot water from the condensed steam, runs out at the other end, and in its passage the steam heats the vinegar to 170° of Fahrenheit's thermometer.

Matters being thus prepared, a bed of tan is to be laid in the bottom of the chamber, three or four feet thick, and the walls all around are to be lined with the same material, or with horse litter, or straw, to the thickness of 12 inches; which is to be supported in its upright position by boards. On a level with the top of the lower bed of tan, a wooden trunk, 5 or 6 inches in diameter, passes out horizontally, through the wall of the chamber, in which a stopper is fitted, having an aperture through it, about half an inch across; the use of which trunk is to admit a thermometer to ascertain the heat of the chamber, and to afford a passage for the entrance of air.

When the whole is thus disposed, the sheets of lead are to be put into the chamber; the lowest of which is to cover the bed of tan horizontally, close to three sides of the chamber; and to come within a short space of the fourth side, leaving an opening between them for the vapour of the heated vinegar to pass upwards; the next sheet of lead is to be laid over the first in a similar manner, a short space above it, where it is to be supported by staves, or by rolls of sheet lead, having laths, or battons, passing across them; but it is to be placed close to the wall, over the opening left by the first sheet, and to leave a similar vacant space at the opposite side; and in this manner all the rest of the sheets of lead are to be piled up, one over the other, until they reach near the top of the chamber; care being taken that they may each fit close to the walls at three sides of the chamber, and that the apertures left at the fourth side, may be at opposite sides alternately; by which means the hot vapour of the vinegar will pass from side to side, back and forwards, over and under all the surfaces of the lead sheets. The upper layer of lead is then to be covered with boards, on which a bed of tan or litter is to be placed to confine the heat, through which covering, a vertical pipe is to ascend, by which the state of the vapour from the vinegar may be ascertained by proper tests, but which is to be kept covered when not used for this purpose.

The number of the sheets of lead which are to be piled up, as before described by the patentee, is to depend on the nature of the vapour that comes out of the pipe last-mentioned, at the top of the chamber, which may be regulated by the quantity of vinegar put into the cistern, it being intended that the acid should be entirely decomposed by the lead before the vapour escapes, which is to be determined as before stated. The number of these sheets, exhibited in the drawing, is ten, which we suppose may be sufficient for a chamber of the dimensions there represented.

The patentee states also, that his plan for making white lead, or of causing vinegar to act on lead, may be combined with the method of making vinegar, described in the specification of his former patent, (of which we gave an account in vol. I. p. 219,) by substituting sheets, or rolls of lead, for the birch twigs, which are there directed to be placed in the upper part of the casks, or vessels, in which the vinegaris to be submitted to the action of his apparatus.

Remarks of the Ed. of Repert.—The Roman cement, directed to be used in forming the receptacle for the vinegar, above described, we consider very objectionable, as this acid would act speedily on that cement, or on any other that contains lime. If the patentee desires to have brick cisterns, united by cement, for the chambers to contain the vinegar, he should use either resinous, or wax cements; or perhaps he might find that pipe clay, dried, and kneaded with linseed oil, would answer the purpose; we, however, think, that brick cisterns are so liable to leaks from other causes, that they are not at all adviseable for the purpose recommended by the patentee. We also object to the lead steam pipes, directed to be passed through the vinegar, as when heated it would first oxidize them, and then quickly dissolve the oxide thus formed, so as speedily to destroy the pipes; of any of the metals cheap enough for an application of this nature, tubes of tin, would alone be proper for this purpose, as vinegar has but little action on the surface of this metal.

[*Repert. Pat. Inven.*

To Thomas Halahan, of York-street, Dublin, Lieut. in the Royal Navy, for machinery, or apparatus, for working ordnance. Dated June 22, 1826.

Lieutenant Halahan's apparatus for working cannon, or ordnance, is designed to make them run out of the embrasures, or port-holes, in a proper position for being discharged after being loaded, without requiring any manual labour for the purpose.

The cannon to which this contrivance is applied, is, as represented in the drawing attached to the specification, placed on a carriage, with four low wheels, such as is used in ships; which carriage is sustained by a narrow platform, of the length permitted to the recoil, rising a little above the deck, and turning horizontally on a strong pivot beneath the port-hole, so that it may be moved round to any angle with the latter, which the pointing of the gun may require. A long groove is made through the middle of this platform, in which a piece, descending from the middle of the gun-carriage, is fitted, so as to slide freely backwards and forwards, while a second piece, fixed across it beneath the platform, prevents the carriage from rising upwards, and confines its motion entirely to the direction of the long groove. Underneath the platform, near the pivot, round which it traverses, a cylindrical box is fastened in a horizontal position, in front of the long groove, containing a strong spiral spring of the kind used in clocks, and arranged in a similar manner to the boxes of such springs; round which box, a strong cord, or flexible chain, is rolled as many turns as the length of the groove will require, and its farther end is fastened to the piece that descends from the gun-carriage through the groove, when the gun is in the position that it assumes on being run out of the port-hole after being loaded.

The whole being so arranged, it is evident, that when the gun is discharged, it's recoil will, by the cord, or chain, wind up the spring,

by turning the box round, in which it is contained; and the gun being retained at the end of the recoil by a catch, which will be described, on withdrawing the catch it must of course be drawn up to its first position by the action of the spring, without any farther trouble.

The catch just mentioned, consists of a long narrow piece of metal, cut at one side into ratchet teeth, like those of a saw, which is fastened at one end, by a pivot, close to the side of the groove, underneath the platform, with its teeth in contact with the piece that descends from the gun-carriage, while its other end, which is that farthest from the port-hole, is sustained by a cross bar fastened underneath; and being drawn towards the groove by a spiral spring at the opposite side, a light chain passes from it over a pulley to a lever at the same side of the groove, where it is placed; which lever, being raised, draws the catch by the chain from the descending piece, by which it holds back the gun carriage, and immediately permits the main spring to act in drawing forward the gun out of the port-hole, as before mentioned.—*Ib.*

To Robert Hicks, of Conduit Street, in the County of Middlesex, Surgeon, for his invention of an Improved Bath.

The improvement proposed by the patentee, is the introduction of a flue in the bottom of a portable bath, or slipper, the water in which is to be heated by the flame of turpentine, or other combustible fluid, or by illuminating gas.

The general form of the bath is not intended to differ from the ordinary kind of portable vessels commonly used for chamber-bathing, which run upon castors, and are calculated to hold an adult person in a recumbent posture. The vessel may be made of copper or sheet iron, and have a broad thin flue made of metal tubes, extending over its bottom, and a recess in front, into which the combustible fluid is to be poured, with a board covering the flue, as a flooring to the bath, to prevent the surface of the heated metal from burning the bather.

A vessel on the side of the bath, is to hold a sufficient quantity of turpentine or other combustible liquor to feed what may be called the furnace beneath, for heating the cold water contained in the bath. The combustible liquor is delivered through a small pipe and cock, into the receptacle or furnace in front of the bath, and being there set fire to, the flame passes through the flue under the bath, and heats the water in a few minutes, the smoke and heated vapour passing off through a temporary chimney at the end of the flue into the fire place of the room.

Instead of turpentine or other inflammable liquor, the patentee proposes, under some circumstances, to employ a portable vessel filled with condensed illuminating gas, and to carry the burner under the bath, passing its flame through the tube as described above.

In this manner water may be heated for ordinary warm bathing,

or any other medicated fluid may be employed, and after use, be drawn off by a cock in the lower part of the vessel.—*Newton's Journal.*

To Charles Macintosh, of Crossbasket, in the county of Lanark, in Scotland, Esq. for his Invention of a new process for making Steel.

The object of the patentee, is to communicate carbon to iron, when raised to a very high degree of temperature, by bringing into contact with the iron, gases which are impregnated with carbon. The gas which is proposed to be employed in this process, as most convenient and economical for the purpose, is that evolved from coal when under distillation.

To perform the operation, the patentee proposes no particular construction of apparatus, but merely that the iron which is to be converted into steel, shall be enclosed in a crucible or melting pot, made of the usual materials, and inserted in the furnace, and that when the temperature of the iron is sufficiently raised, a jet or current of the gas shall be thrown into the crucible through a suitable aperture, and tube, provided for that purpose, and that another aperture shall be made in the cover of the crucible, to allow that portion of the gas to escape which has not been taken up by the iron.

These are all the instructions given for the performance of the process, as the patentee claims the impregnation of iron at a high temperature, with carbon in a gaseous form.—*Enrolled November*, 1825. [*Ib.*

To William Pope, of Ball Alley, Lombard Street, in the City of London, Mathematician, for his having Invented certain Improvements on Wheeled Carriages.

The improvement herein proposed is designed to prevent the overturning of carriages, in the event of one of the wheels running upon a bank, or over a large stone, or any other elevation by which the side of the carriage might be raised, so as to endanger its falling over.

The plan proposed by the patentee (which is very imperfectly set out in the specification) appears to be a mode of connecting the axle-tree of the hinder wheels of the carriage, to the axle-tree of the fore-wheel, by means of a horizontal spindle or axle; by which mode of connecting the two axle-trees together, whenever one of the wheels is raised by running over an elevation, its axle-tree, in rising, turns in a vertical direction upon this connecting spindle, without lifting the other axle-tree, hence the body of the carriage is enabled to preserve its level position.

The same contrivance is said to be applicable to two wheeled carriages, but in what way it is to be adapted we do not perceive.

It is intended, if we are not mistaken, to fasten the shafts, or if a

curricle, the pole to the body of the carriage, allowing the axle-tree to turn upon a horizontal pin or spindle, connecting the body of the carriage and the axle-tree together; and in that case the ends of the shafts are to be braced tightly to the shoulders of the horse, which is to be provided with suitable straps and harness for the purpose.—*Enrolled June*, 1826. [*Ib.*

To NATHANIEL KIMBALL, *of New York, in the United States of North America, but now residing in Falcon Square, in the City of London, Merchant; in consequence of a communication made to him by a certain Foreigner residing abroad, for the Invention of a process for converting Iron into Steel.*

THE converting of iron into steel, is by the introduction of carbon into the metal, which is usually done by surrounding the iron with charcoal, or some other carbonaceous matter, in a furnace. The improvement proposed by the patentee, is not in the mode of conducting the operation, but in the material, or composition, employed for that purpose.

Instead of charcoal, a mixture of one ounce of sal-ammoniac, one ounce of borax, one ounce of alum, and one quart of fine salt is to be prepared; which, after being enclosed in a retort or other vessel, and submitted to a red heat, is to be allowed to cool, and then to be pounded into a fine powder. Another mixture is also to be made, consisting of four quarts of soot, two quarts of the powder of burnt leather, two gills of burnt horses'-hoofs, one pint of fine salt, one quart of vinegar, and two quarts of wine. These are to be stirred up together to the consistency of mortar, and when dried into a cake, are to be pounded as the former.

The two mixtures of materials are now to be carefully compounded together, and sifted over the surface of the several layers of iron which is about to be converted into steel, the iron being afterwards closed up in a vessel, and covered with sand, to prevent the access of air, or any kind of gas, to the interior of the vessel.

In this way, the patentee proposes to convert any kind of wrought iron articles, such as sword blades, or knives, into steel, taking care to cover the iron with the prepared compound, and to submit the articles, in closed vessels, to the action of the heated furnace; the time requisite for effecting the object, must depend upon the substance of the articles under operation, which can only be known by experience; from eight, to twenty eight hours, the patentee says will be required, and the quantity of carbonaceous material described above, will be sufficient for converting one hundred weight of iron.—*Enrolled April*, 1826.

The patentee, in proposing the employment of several of the materials which constitute the above described mixture, and the particular proportions of each as stated above, certainly does not mean for us to consider the common sense of the case, but to look upon it

as a *magical* compound. Our readers will find all the essential parts of the materials above mentioned, described in the several patents for preparing iron and steel in our preceding volumes.—[*Ib.*

To John Beever, *of Manchester, in the County of Lancaster, Gentleman, for his having Invented an Improved Gun Barrel.*

The patentee's invention is the making gun barrels of an oval or elliptical figure in the bore, instead of circular, as usual, which he considers will discharge shots in a more effective range, than the circular barrels of the ordinary construction.

It is proposed, to take the ordinary kinds of gun barrels in their rough state, after they have been welded into the cylindrical form usually adopted, and to heat them red-hot, then pass an elliptical rod into the barrel by hammering or otherwise, so as to enlarge its diameter in one direction, and to compress it in the other; that is, press the circular tube into an elliptical figure. When the barrel has been thus formed, it may be completed by drawing, in the manner that tubes are commonly drawn, and then finished by the insertion of a breech in the ordinary way; after which the gun is to be fitted to a stock, and the other parts appended as usual.

The manner by which the barrel is formed into the elliptical figure, constitutes no part of the invention: that may be done by any convenient means, the substantial part of the invention being the employment of elliptically bored gun barrels, instead of circular bores as usual, and which the patentee considers will give a more effective range to the charge of shot than the old form.—*Enrolled April*, 1826. [*Ib.*

On the Economy of using highly Elastic Steam expansively. By Jacob Perkins, Esqr.*

[*With a Plate.*]

The diagram, figs. 1 and 2, in the plate, will show the economy of using steam expansively, and also the method of compensating for the inequality of the pressure on the piston, which, if steam of 400lbs. to the square inch is used, and stopped off at the quarter stroke, will end its stroke at 100lbs. per inch. The diagram will also show that the velocity of the piston is continually varying, while the crank is uniform in its motion.†

From repeated experiments and much reflection, I am led to believe that there is great economy in using very high steam, and that

* The above article is subjoined to that on the Explosion of Boilers, in the pamphlet received from Mr. Perkins.—[*Editor.*

† It is not pretended that this diagram is mathematically accurate; the object being merely to explain to the practical mechanic, in a sufficiently clear and concise manner, the principle of the advantage gained by using steam expansively.

expansively; that the higher you can practically use the steam the sooner you may cut it off. The diagram shows the gain in cutting off the steam at quarter stroke. Let the piston, which is represented by the line *k.* 1 *a.* descend to *i. b.*, being one quarter of the stroke, with a constant pressure of 400lbs. per square inch. At this point, let the steam be cut off and expand to double its volume; when it arrives at *h. c.* it will be exerting a pressure of 200lbs. per inch, producing a mean of 300lbs. per inch, through the quarter stroke. Let the steam again expand to double its volume, and the piston will finish its stroke at *f. e.* at 100lbs. per inch, giving a mean of 150lbs. per inch for each quarter, which add to the other two quarters, 400. 300. 150. 150. and the whole sum will be 1000,* giving an average pressure of 250 per square inch. It will be seen that, when the stroke is completed, the cylinder will be filled with steam at a pressure of 100lbs. per inch, which will be the same in quantity as though the steam had begun with a pressure of 100lbs. per inch, and continued all the stroke at that pressure. By using the same quantity of steam expansively, beginning at 400lbs., there is a gain of 150 per cent. If the steam is used at 600lbs. per inch, and cut off at one-eighth of the stroke, 225 per cent. will be the gain. To compensate for the unequal pressure of the steam on the piston, two cylinders should be used, particularly for steam-boats and pumping, where the fly should be dispensed with. With the following arrangement, it will be seen, while one of the pistons is at its greatest power, the other is acting with a diminished power.

The piston 1, fig. 1, in descending from *a* to *b*, moves in the same time through only half the space through which the crank moves, as will be seen by its path from 1 to 3. A force of 400lbs. is exerted on the square inch (that being the pressure of the steam,) in the first quarter of the stroke: at this point the steam is cut off, leaving the other three-fourths of the stroke to act expansively. The piston 1, fig. 2, having completed half its stroke, when piston 1, fig. 1, begins its stroke, and consequently a compensation, near enough for all practical purposes, takes place.

It will be seen, that while the piston 1, fig. 1, has performed one-fourth of its stroke, that the piston 1, fig. 2, has moved from *c* to 6, performing seven sixteenths of its stroke in the same time. The mean in each quarter, from *c* to *e*, fig. 2, being 150lbs., the amount of pressure to be added to the first quarter of the stroke of the piston, fig. 1, (which was 400lbs.) is 275lbs., producing an available power of 675lbs. at this part of the stroke. The piston, fig. 2, now moves but two-sixteenths of its stroke from 6 to *e*, and *f* to 8, while the crank moves through two of its divisions, from 6 to 8, which would, in another part of its path, move (within a fraction) with the same velocity as the piston. The piston, fig. 2, in moving from 6 to *e*, gives a power of 25lbs., being the last of the expansion which ends

* If the steam had continued the whole length of the stroke at 400lbs. per square inch, the sum would have been 1600lbs. consuming four times the steam with the addition of only 60 per cent. to the power.

at 100lbs. per inch. The piston, fig. 2, in moving from *f* to 8, being the beginning of the stroke, gives a power of 100lbs.; thus a power of 125lbs. will be acting on the piston 1, fig. 1, while moving from *b*, to *d*, giving a power of 475lbs. to which add 125, will show a power of 600lbs. at this part of the stroke. The piston 1, fig. 1, now descends from *d* to *e*, being the last quarter of the stroke, giving 125lbs. of power to act with the piston 1, fig. 2, while moving from 8 to *h*, giving a power of 600lbs., add to this the 125lbs. and it will give a power of 725lbs. at this part of the stroke. The piston 1, fig. 1, now begins its stroke of 400lbs. per inch at *f*, and continues to *g*, with the same power, while piston 1, fig. 2, moves from *h* to 12 giving a power of 300lbs. to be added to the 400lbs., obtained at the first quarter of the stroke of the piston 1, fig. 1, at *f* and *g*, producing at this part of the stroke, 700lbs. of power. The piston 1, fig. 1, now moves from *g* to *i*, giving a power of 475, while the piston 1, fig. 2, moves from 12 to *k* and *a*, to 2, giving a power of 125, which add to 475, gives a power of 600 at this part of the stroke. The piston 1, fig. 1, now moves from *i* to 1, being the last quarter of the stroke, giving a power of 125lbs., while the piston, fig. 2, moves from 2 to *c*, producing a power of 600; to which add 125lbs. will make 725lbs. at this part of the stroke.

By this arrangement, it will be seen, that a compensation is obtained, giving a more equable power than that which is produced by the single engine, whether high or low pressure, since it is well known, that at two points of the revolution of the crank, the power ceases, during at least one twelfth of the time, which is the reason that so large a fly-wheel is necessary. It is particularly applicable to steam-boats, and may be used to great advantage in the double pump, as well as the balance-bob lifting pump, used in Cornwall for mining purposes, by the use of proper gearing. The present single stroke expansive engines, used in Cornwall for pumping, are preferred to all others, on account of their economy, although they are very limited as to the extent of the expansive principle, for want of compensation, as nearly the same power is wanted to finish the stroke of the pump, as to begin it.

The variation of the velocity of the piston, occasioned by the compound motion of the crank, and connecting rod, is not taken into view in this diagram. As the connecting rod is intended to be four diameters of the path of the crank, the variation will make no practical objection, being, at its greatest value, but one-thirty-second part of its range. If the engine should be worked by a connecting rod, as is sometimes the case in steam-boats, say only one diameter of the path of the crank, the variation at each end of the stroke, would amount to a practical defect, since the piston would move with nearly three times the velocity at the lowest quarter of the stroke, that it would at the first quarter. Thus circumstanced, the crank must be above the cylinder.

As the law of expansion seems not yet to be settled, an arithmetical expansion has been used for this diagram, which, from its approximation to the real law, will be quite near enough for practical purposes.

Fig 1

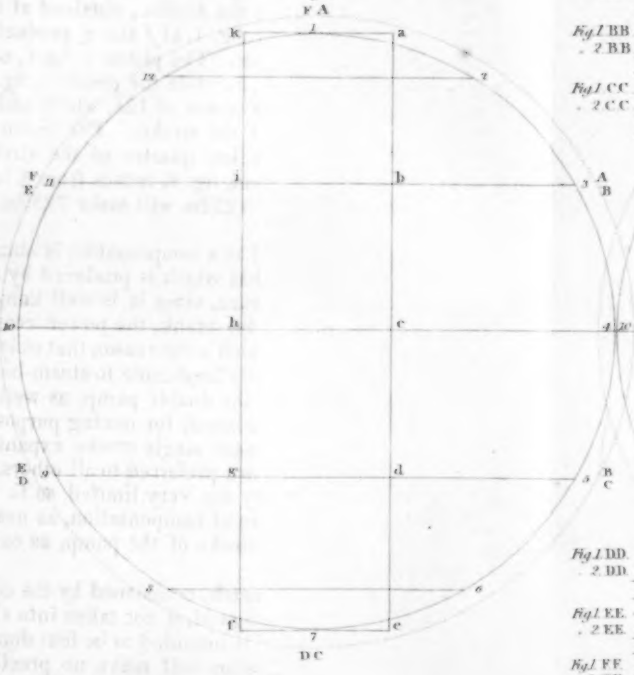


Fig 1 AA 400
2 AA 275
675

Fig 1 BB 475
2 BB 125
600

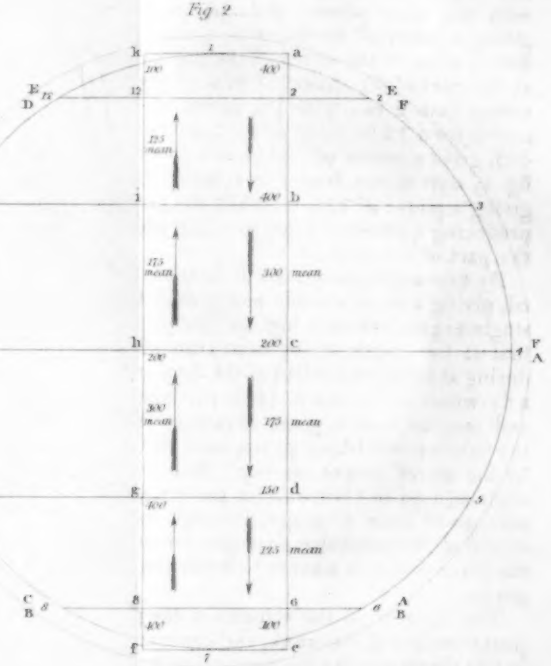
Fig 1 CC 125
2 CC 600
725

Fig 1 DD 400
2 DD 275
675

Fig 1 EE 475
2 EE 125
600

Fig 1 FF 125
2 FF 600
725

Fig 2



at 100lbs. per inch. The piston, fig. 2, in moving from *f* to 8, being the beginning of the stroke, gives a power of 100lbs.; thus a power of 125lbs. will be acting on the piston 1, fig. 1, while moving from *b*, [illegible] will show a power at the first quarter. Thus circumstanced, the crank must be above the cylinder.

As the law of expansion seems not yet to be settled, an arithmetical expansion has been used for this diagram, which, from its approximation to the real law, will be quite near enough for practical purposes.

Many who are of the school of Tillock and Wolf, believe that the expansive power of steam depends upon heat only; while the Soho experiments are said to prove that elasticity depends simply on density, without regarding temperature, viz., that if a cubit foot of steam at atmospheric pressure, weighs one ounce, 50 atmospheres of steam would weigh 50 ounces; but Dalton, who is undoubtedly much nearer the true law, would make 50 atmospheres weigh but about 34 ounces.

I have no doubt that the nearer the atoms of water are made to approach each other, by compression, the greater will be the repulsive action of caloric, and that, in a more rapid ratio than has hitherto been allowed, especially in highly compressed steam. Its comparative density with the increase of power, diminishes faster than has been supposed even by Dalton.

FOR THE FRANKLIN JOURNAL.

MECHANICAL JURISPRUDENCE.—No. XVIII.

BY PETER A. BROWNE, ESQ.

On the Law of Patents for New and Useful Inventions.

[CONCLUDED.]

ON THE DEFENCE WHICH MAY BE MADE.

The different parts of the acts of Congress, respecting patents, may be thus arranged. The 6th section of the act of 1793, provides, that when any action is brought for a breach of the patent right, the defendant may plead the *general issue.* As the 3d section of the act of the 17th of April, 1800, (which was enacted to supply the 5th sec. of the act of 1793) provides, that the action shall be *on the case*, the general issue would be "*not guilty.*"

Under the general issue, the defendant may give in evidence, the act of Congress. He may also give in evidence, any special matter, tending to prove either of the following things, viz.

1. That the specification, filed by the plaintiff, does not contain the whole truth relative to his discovery.

2. That the specification contains more than is necessary, to produce the desired effect.

3. That the thing thus secured by patent, was not originally discovered by the patentee, but had been in use, or had been described in some public work, anterior to the supposed discovery of the patentee.

4. That the patentee had, surreptitiously, obtained a patent for the discovery of another person.

To the 1st and 2d defences, the act adds, that the concealment, or addition, must fully appear to have been made for the purpose of deceiving the public. And in order that the plaintiff may not be taken by surprise, by giving either of these defences in evidence

under the general issue, the same section provides, that the defendant shall give to the plaintiff, or his attorney, notice in writing, of the special matter, thirty days before the trial.

The decisions under the foregoing heads may be thus arranged.

1st. *The specification or description does not contain the whole truth.*

In making this description, *no part* of the invention must be omitted, *the whole* must be described. Bul. n. p. 77. "If the specification be, in any part of it, materially defective, the patent is against law, and cannot be supported."

A patent was granted for making steel trusses, and the patentee omitted to state, that in tempering the steel, he rubbed it with tallow, and the patent was avoided. Liardet *v.* Johnson, cited in 1 Term. Rep. 602.

Nor must any mode that is more beneficial, be omitted. Brown took out a patent for a machine to make bobbin lace, and he omitted to describe the bending together two teeth of the dividers; and Lord C. J. Gibbs said, that "if this more beneficial mode of working was known to him, when he took out his patent, the patent would be void." 2 Marshall's Rep. 211. So in Turner *v.* Winter, 1 Term. Rep. 602, Buller, J. says, "If he makes the article with *cheaper* materials than those he has enumerated, the patent would be void."

2dly. *That the specification contains more than is necessary.*

In Turner *v.* Winter, 1 Term. Rep. 602, Buller, J. says, that "if the patentee could only make the article proposed, with two or three of the ingredients specified, and he has inserted others which will not answer the purpose, that will avoid the patent." So in King *v.* Arkwright, Buller, J. says, "if these things are of no use, but thrown in merely to puzzle, the patent is void."

3. *To make out a defence upon either of these grounds, under the act of Congress, it must be made to appear, that there was an intention to deceive the public.* Whittemore *v.* Cutter, 1 Gallisson's Rep. 429.

It must be understood, that although the act of Congress enumerates certain defences that the defendant may make, yet he is not confined to these. Judge Story, in the case of Whittemore *v.* Cutter, 1 Gallisson's Rep. 429, says, "It is very clear that the 6th section does not enumerate *all* the defences, of which the defendant may, legally, avail himself; for he may clearly give in evidence, that he never did the act attributed to him; that the patentee is an alien, not entitled under the act; or that he has a license or authority from the patentee."

THE JUDGMENT.

Although the patentee, *in England*, has been defeated in one action, he may maintain fresh suits against other persons; as was done by Mr. Arkwright, and by Mr. Watt.

In Arkwright *v.* Nightingale, Davis' Patent Cases 55, Lord Loughborough expresses himself as follows, "It has been said, that many

persons have acted upon an idea that Mr. Arkwright had no right, he having failed to establish it when this cause underwent an examination in another place, in which the event was unfavourable to him. If the question at present were, what damages Mr. Arkwright should have received for the invading that right, I would have allowed the parties to have gone into evidence to show, to what extent persons had acted upon the faith of the former verdict; but the question now is upon the *mere right:* and if the result of this cause is in favour of the plaintiff, the verdict will be with one shilling damages. A future invasion of this right would entitle Mr. Arkwright to an action for damages, but in the present case they are not asked."

In the United States, the law is different: by the 6th sec. of the act of Congress of 1793, which is the one enumerating certain defences, which a defendant may make to a suit on a patent, it is declared, that "in either of which cases judgment shall be rendered for the defendant with costs, *and the patent shall be declared void.*"

OF THE REMEDY, IN ENGLAND, BY A BILL IN CHANCERY.

Beside the remedy, by action at law, for the infringement of a patent right, the English law gives another, which must now be noticed.

The patentee may file a bill in Chancery to establish his letters patent, and for a perpetual injunction against any one who undertakes to use his invention without his license.

In order to obtain the injunction, the party applying, must swear as to his belief, that he is the *original inventor.* Hill *v.* Thompson, 3 Merivale's Rep. 622. The Lord Chancellor observed, that "although when he obtained the patent, he might very honestly have sworn as to his belief of such being the fact, yet circumstances may have subsequently intervened, or information been communicated, sufficient to convince him that it was not his own original invention, and that he was under a mistake when he made his previous declaration to that effect.

To this bill filed by the plaintiff, the defendant may file his answer, denying the plaintiff's exclusive privilege; upon which the Lord Chancellor will direct an issue at law, to try the right. *If the patentee has been long in the exclusive enjoyment of his patent, an injunction will be issued against the party invading it, until the right is tried at law.* This was decided in Harmer *v.* Plane, 14 Vezey 130. This was upon a motion to dissolve an injunction, which had been obtained by the patentee of a machine for manufacturing woollen cloths, against one who had used it; and the Lord Chancellor observed, "there has been sufficient possession under this patent, to make it fit that it should be tried; taking care that it shall be tried speedily. It may be put in the shape of a case, stating the specification and facts, sufficient to introduce the question."

The injunction will be issued although the Chancellor has doubts whether the patent is good.

For this rule we have the authority of the case last cited. The Lord Chancellor prefaced the remarks above quoted, by this observation, "I feel very doubtful whether that (the allegation upon which the plaintiff founded his right) can be made good."

The same principle will be found in 6 Vezey, 707. The Universities of Oxford, &c. *v.* Robertson.

If the patent be clearly bad, the injunction will not be granted.

This may be collected from the case of Grierson *v.* Eyre, 9 Vezey, 341. It was a bill by the king's printer, in Ireland, to establish his right to print the statutes of Ireland, against the king's printer in England, and the court being clearly of opinion with the defendant, dismissed the bill.

Formerly the practice was, that the party was sent *to law* to establish his right, and then went into Chancery again, for account; as will appear by an anonymous case in 1 Vernon's Rep. 120. Upon a motion for an injunction to stop the sale of certain Bibles, the Lord Chancellor said "Let there be a trial at law, and let the king's patentee be plaintiff, and the defendants admit that they have sold 12 Bibles; *and when the trial is over, come back again.*"—

As the right under letters patent appears on record, it has been held unnecessary to establish the right at law, previously to filing the Bill.

An exception however, must be stated to the last rule, which is this, that the court will not grant the injunction, in the first instance, where the patent is recent.

This distinction is taken in Hill *v.* Thompson, &c. 3 Merivale's Rep. 622. It was a bill praying an injunction, to restrain the defendants from selling, &c. any iron smelted, or worked, by the plaintiff's improvement, and the Lord Chancellor said "Where a patent has been granted, and an exclusive possession of some duration under it, the court will interpose its injunction, without putting the party previously to establish the validity of his patent, by an action at law; but where the patent is but of yesterday, and upon an application being made for an injunction, it is endeavoured to be shown, in opposition to it, that there is no good specification; or otherwise, that the patent ought not to have been granted; the court will not, from its own notions respecting the matter in dispute, act upon the presumed validity, or invalidity, of the patent, without the right having been ascertained by a previous trial; but will send the patentee to law, and oblige him to establish the validity of his patent in a court of law, before it will grant him the benefit of an injunction."

The verdict of the jury between the parties at law, will be considered by the Chancery Court, as final and conclusive. Hill *v.* Thompson, 3 Merivale's Rep. 631. *But the Court of Chancery, will give an opportunity to move for a new trial, in the Court of Law.* 3 Merivale's Rep. 631.

During the pendency of the suit at law, the Court of Chancery will oblige the defendant, to keep an account of the profits. 3 Merivale's Rep. 6.

OF PROCEEDINGS IN EQUITY IN THE CIRCUIT COURT OF THE UNITED STATES.

The equity side of the Circuit Court of the United States, will take no cognizance of a suit in equity, relating to a patent, between citizens of the same state, as Congress have not expressly given them that power.

Livingston and Fulton, were the proprietors of steam boats on the Hudson, and claimed the exclusive right to navigate the waters of New York in that way, by virtue of two patents from the United States, and several laws of New York. Van Ingen, and others, built, and were using, on the same river, a steam boat for carrying passengers, and were building another. The former filed a bill on the equity side of the Circuit Court of the United States, praying to be quieted in the possession, and enjoyment, of these rights, and an injunction to restrain the defendants from constructing, and using, the boats. All the parties were citizens of the state of New York.

The defendants contended, that the Circuit Court of the United States, as a Court of Equity, between citizens of the same state, had no jurisdiction of the cause. Livingston, J. delivered the opinion of the court, confirming the plea of the defendants, that its jurisdiction did not extend to cases of this description.

Every patron of American genius, will join me in regretting, that the power of administering this *remedial* justice, does not reside in some court of the United States. The wisdom of the English law, in this particular, in giving authority to its courts to interpose their powerful arms, to restrain the piratical invader of a patent right, must, I think, be acknowledged by all. Nor can we withhold our approbation from the equal manner in which the Courts of Chancery dispense justice to the patentee and the public, as explained in the present essay. If the invasion is glaring, they stop the invader's progress immediately: if it is too doubtful, they order the defendant to keep an account of his profits, to answer the plaintiff in case his right shall eventually be made to appear: if the patentee's pretensions are unsupported, they refuse their aid. In all cases their final decisions depend upon the patentee's right as established at law; to try which, fairly, and speedily, they oblige each party to concede matters of form.

For want of such a power in the United States, we have, more than once, seen persons, in defiance of justice, openly invading the patent rights of their fellow citizens, and enriching themselves with the spoils, while the patentee is pursuing a long protracted action of damages. It is for Congress, in their wisdom to apply a remedy for this evil.

PROCEDURE IN CONTESTING A PATENT IN THE DISTRICT COURT.

Another method of contesting a patent, for the fourth reason enumerated in the sixth section, is pointed out in the tenth section, which provides that "within three years after issuing the patent, upon an oath or affirmation being made before the judge of the Dis-

trict Court, where the patentee, his executors, administrators, or assigns, reside, that the patent was obtained *surreptitiously* or upon *false suggestion*, the court, upon motion made, if the matter alleged appears to be sufficient, may grant a rule to show cause why process shall not issue to repeal the patent. And if sufficient cause be not shown, the rule is to be made absolute, and process is to issue against the patentee, or his executors, administrators, or assigns, with costs of suit. And if no cause is shown, or if it shall appear that the patentee is not the true inventor or discoverer, judgment to be rendered to repeal the patent. If the party complaining has judgment given against him, he is to pay all the costs."

The practice under this section is, for some person to make affidavit of the facts upon which the application is founded. Upon the presentation of this exparte affidavit to the District Court of the United States where the patentee, his executors, administrators, or assigns, reside, a rule is granted to show cause, on some day therein mentioned, why process should not issue against him or them, to repeal the patent. Upon the day of the return of this rule, if sufficient cause is not shown, the process issues. This process is a writ of scire facias to repeal the patent. To this writ the party, defendant, may plead, or demur, as best suits his defence.

If the question turns upon a matter of fact, a jury are summoned, and impannelled, as in other cases in that court.

In England this proceeding assumes the form of a writ of scire facias, which issues out of the Court of Chancery, to repeal a patent.

This writ, out of chancery, lies, in the ordinary course of justice, in three cases.

1. When the king, by several letters patent, grants the same thing to several persons, the former patentees have a sci. fac. to repeal the second letters. 4 Inst. 88.

2. When the patent has been obtained upon *false suggestions;* the king *jure regio*, may have the scire facias. 4 Inst. 88.

3. When the king grants any thing which by law he cannot grant, he, *jure regio*, may have the scire facias. 4 Inst. 88.

It would appear from an examination of the cases to be found in the English Books, of writs of scire facias to repeal patents, that any cause may be shown which would be a good defence in an action for an invasion of the patent right.

In King *v.* Arkwright, Westminster, 1785, cited Bul. N. P. 77. Davies on Patents, 61, three valid issues were joined: 1. That the patent was not new. 2. That the patentee was not the inventor. 3. That the specification was insufficient.

When any facts are disputed, issues are formed, and the parties are sent into a court of law to try them. If the issues are found against the patentee, the judgment is that the said letters patent be revoked, and declared void, and the enrolment be revoked.

But in the United States, in order to justify a judgment against a patentee, by virtue of this tenth section of the act of Congress, he must have been guilty of some *deception* or *misconduct;* he must

have used some *false suggestion*, or been guilty of some *surreptitious proceeding*. This was decided by Judge Davis, in the case of the proceeding to cancel Odiorn's patent, in the District Court of the United States, for the Massachusetts District, in December term, 1811.—MS.

The same appears in the case of Jeremiah Bailey's patent. Upon the affidavit of Oliver Evans, "that Bailey had obtained his patent upon false suggestion, to wit, upon the suggestion that he is the original inventor thereof." A rule was granted by the District Court of the Pennsylvania District, to show cause why process should not issue against Bailey, to repeal his patent. This rule was made absolute by consent, and without prejudice, and an amicable scire facias was taken out, and filed, to which Bailey appeared, and pleaded not guilty. The cause came on to be tried before the court, and a jury for that purpose summoned and impanneled, on the 21st day of June, 1814.

It was contended, on behalf of the relator, that if Bailey had been the true inventor, and had taken out his patent erroneously, supposing that he was the original inventor, when, in truth, the invention had been previously made by another, that this amounted, in law, to *false* pretences.

Peters, Judge, charged the jury to the following effect;—that the subject lay within a narrow compass. The proceeding (he said) was of a summary nature, and it would have a very dangerous tendency to extend the enquiry to the length that had been contended for by the counsel for the plaintiff. The question was, whether Bailey's patent had been *surreptitiously* obtained. He said, that he understood the expression in the 10th section, "false suggestions," to be tantamount to surreptitiously; and that the sufficient cause which is to be shown, is, that the party had obtained his patent surreptitiously, or upon false suggestions. That the distinction taken between the *true* and the *original* inventor, was important only as regarded the mode of proceeding. If the patentee was not the *true* inventor, it would justify this summary proceeding. The utility of Bailey's patent was not, he thought, a proper subject of enquiry at that time.

ON SURRENDERING A PATENT.

It has been doubted whether a patent can be surrendered, but this was decided by Thompson, J., in Huntingdon *v.* Morris, MS. rep. C. C. U. S. N. York.

"I see no objection to entering a *vacatur* of the patent of record in the department of state, if taken out inadvertently, and by mistake: all the proceedings in that department, on the subject of patents, are *ex parte*, except in the case of interfering applications. The department act rather ministerially, than judicially, and upon the representation of the applicant, without entering into an explanation of the question of right: and I see no good reason, why, on a like *ex parte* application, the patent might not be surrendered, and cancelled of record, if no misconduct was imputable to the patentee in

taking it out. The only record evidence of the patent, is that in the department of state, and in the letters patent in the hands of the patentee; and, if the letters patent are surrendered, and cancelled of record, the invention would be open to public use, without hazard, so far as depended on such patent.*

FOR THE FRANKLIN JOURNAL.

Observations on the received Theory of Falling Bodies, and an attempt to prove that it is, in part, incorrect. By THOMAS W. BAKEWELL, ESQ.

I SUBMIT the following remarks, with some degree of reluctance; and my hesitation in so doing has no slight grounds, for the principles set forth, and endeavoured to be sustained, are at variance with opinions which have been held to be indisputable, ever since the adoption of the Newtonian doctrine. I have, however, the more confidence in them, from their being in strict accordance with all the fundamental principles established thereby.

I contend that, all bodies falling by the attraction of gravitation, approach each other with the same velocity, in equal times, howsoever great, or small, the gravitating force may be; or howsoever great, or small, may be the quantity of matter contained in the bodies (or either of them) so attracted; and that the *rate* at which matter obeys gravitation, pervades the material universe, as fully as the attraction of gravitation *itself*. I also contend, and in consequence of the above opinions, that a (detached) pendulum, of given length, will not alter the times of its vibrations, in different latitudes, by reason of the oblateness of the earth at the poles, *increasing*, or the centrifugal force at the equator, *decreasing*, the effect of the attraction of gravity: nor would any increase, or diminution of the gravitating force, however great, alter the times of the pendulum's vibrations.

In endeavouring to establish these two positions, we must suppose, (as in all theoretical reasoning on these subjects) an absence of friction, of resisting medium, and of imperfection in the materials. We must also, for the sake of brevity, deal in round numbers, and precise terms, as much as possible; waiving fractional parts, and minute accuracy, where the omission does not affect the argument.

The force of gravitation is not in the least diminished by a body yielding to its impulse: for with whatever velocity one body may be falling towards another, it is attracted as strongly, when under that velocity, as if withheld from obeying it.

Therefore, the fall of bodies would be *instantaneous*, from any distance, however great, but for the *inertia* of matter, which is in all cases in the direct ratio of the attraction, (or weight.)

If a ball weighing one pound, were let fall from a height of 16 feet, it would reach the earth in one second of time. If a ball weighing 100 pounds, were to fall from the same height, it would also fall in

* For the purpose of easy reference, a distinct index to these essays will be furnished, in a future number.

the same time; because, the impeding quality, *inertia*, increases, as the attracting quality, *weight;* and as both are increased a hundred fold, the time of falling remains the same.

If the 100 pound ball were taken to such a distance from the earth, as should lessen the attracting force (or weight) to one pound, it would have lost 99 per cent of its weight, or attracting quality, and also 99 per cent of its impeding quality, *inertia*, and would therefore be in exactly the same situation, as regards the attraction of gravitation, as the first ball, weighing one pound, was, when 16 feet from the earth, and would consequently fall from this point, 16 feet, in one second of time.

Let us now suppose, that while the latter heavy ball, is at this distant point from the earth, where it only weighs one pound, that the attraction of the earth should be increased a hundred fold, the velocity of the ball's falling the 16 feet, would not be increased, or changed, because the inertia, or impeding property, would also be increased at the same rate, and therefore under every degree of gravitating force, or whatever may be the quantities of matter contained in the bodies acted upon by it, the velocity with which they will obey it, is as the rule for falling bodies near the earth, 16 feet the first second, &c.

Whether the *direction* of attraction be compounded of a number of attractions, as is generally the case, or result from one only, the effect is the same.

There is a well defined dividing line of attraction, between the sun and the earth; a body on this line would have no weight, nor any of its concomitant, inertia: if it deviated in the least from this line, (say towards the earth) it would have weight, and, but for *inertia*, its fall to the earth would be *instantaneous;* but as its weight, or the attraction of the earth, increases by its approach thereto, so does its inertia, or impeding quality; so that the body would fall from this dividing line of attraction, or from any point between it and the earth, in the usual ratio assigned to falling bodies near the earth.

Suppose an opening through the centre of the earth, from one surface to the other; here we have every degree of gravitating force, from the greatest at the surface, to nothing at the centre. If a body were let fall from one surface, I believe it will at once be admitted, that it would rise to an equal height on the other side of the centre; and it will also be admitted, that this could not take place, without a continually accelerated velocity of the body *to* the centre, notwithstanding the diminishing attraction of gravity as it approached this point, and the opposing attraction of the superincumbent matter which it had passed; and that its rise to an equal height *beyond* the centre, could not be effected, but for its inertia (in this situation called *impetus*) increasing, to prevent its stopping, as its weight increased by receding from the centre.

Suppose two balls of equal size and weight, when at the surface of the earth, to fall simultaneously, the one from the surface, and the other from a point midway between the surface and centre; this latter ball would reach the centre at the same instant, that the former

reached the latter's point of departure, notwithstanding the difference of gravitating force acting on them during the fall.

Most of my readers have probably seen the experiment of bodies falling in an exhausted receiver, when the lightest particle of down, falls a given distance in the same time as a leaden bullet; and know that the *bulk* of an object, where there is no resisting medium, is no impediment to its fall: now if this leaden bullet, be supposed at such a point between the earth, and sun, as should cause it to weigh no more than the particle of down in the receiver, would it not be under the same influence of gravity, and the velocity of its fall be the same as was that of the particle of down, at the earth's surface, and in the exhausted receiver?

We speak of a body falling to the earth, and by this expression, make the body, *active*, and the earth, *passive;* it is, however, well known, that the fall, or approach, of bodies to each other, is mutual, and the respective degrees of their approach, depend on circumstances to be hereafter mentioned. But I am asked, why it should not be uniform in all cases, since I contend that a body always obeys an attraction at a uniform rate, without regard to the force of that attraction, whether in opposition, or conjunction?

If we suppose the earth, and a small body, situated a certain distance from it, to be the only bodies existing, or consider these two, as entirely free from the influence of any other bodies, *the sum of their joint approach*, (or falling together,) would be the usual rate assigned to falling bodies; for whatever might be the difference of the quantity of matter in each, the attraction to each other would be equal; (as much so as two persons having hold of different ends of a string —A, at one end cannot exert any force tending to draw B to him, without causing B to exert a like force tending to draw A to *him.*) And since the attraction of the two bodies to each other, is the only influence acting upon them, they would meet at a point equal distant from both. If we suppose *two* small bodies, instead of one, each containing equal quantities of matter, and placed in opposite directions from the earth, situated as above, then the earth would remain stationary, and both the small bodies would fall to the earth in the same time, from the same distance as the one body did, although the earth, in that case, met it half way: for the law which we assign to "falling bodies," is that, which, more properly speaking, governs "the approach of bodies to each other, by the attraction of gravitation."

The earth, and moon, and all that is in them, form a compound body, with a common centre of gravity, subservient to the sun's attraction and influence; and this common centre of gravity cannot be affected, or changed, by any changes in the parts of this compound body relatively to itself; wherefore, it follows, that when a small body falls to the earth, the earth will fall to it, only so far as preserves the common centre unaltered, and whether it be more or less, does not alter the time of their coming in contact.

A friend of mine thinks that the tides make against my theory;

"for if the waters on the earth are at all influenced by the moon's attraction, they ought to fall to it at once."

In answer, I state, that if the earth were free from the attraction of any other body, there would, of course, be no tides. If the earth were at such an immense distance from an attracting body, as should render the *difference* of attraction between the nearest and farthest side incalculable, then also there would be no tides, however great that attraction might be; for every part of the earth would be attracted alike, and as no part could approach the attracting body, without the whole, no change of shape would ensue.

In the actual state of the earth, the attraction of the sun, assimilates more to the case of the supposed attracting body, than that of the moon does; and the sun has, therefore, less influence, than the moon, in creating the tides, notwithstanding the sun's superior attracting force.

That part of the earth (or water) immediately under, or towards the moon, is not moved by its attraction, because in a direct line with the attraction of the earth; nor would it be in any way, unless the attraction of the moon became greater than that of the earth, (in however slight a degree,) in which case it (the water) would leave the earth, and fall to the moon, in the usual ratio assigned to falling bodies. But as we recede from this part of the earth, the *directions* of the earth's attraction, and that of the moon, form an angle; and the angle increases until the lines of attraction of the earth and moon are at right angles, where the moon's influence is the greatest; for the mean direction of attraction at every angle, is compounded of those of the earth and moon, and causes an alteration of the plumb line; and the greatest alteration, of course, where the lines of attraction are at the greatest angle. The water, which was before on a level, is now on an inclined plane, and flows down it, towards that part of the earth immediately under the moon, at which place the water rises, not from the moon's attraction, (*directly*,) but from the head of water flowing in from all sides. Hence, it is evident, that when the sun and moon are at right angles to each other, their power to rob each other of the water attracted by each is the greatest, and the equalizing property of this influence causes the "neap tides."

The generally received law of falling bodies, is this. All bodies will fall an equal distance in equal times, without regard to the quantities of matter contained in them; but presumes, in the application of the rule, the same gravitating force, and it is exemplified thus. If a ball weighing one pound, fall 16 feet in one second of time, a ball weighing 100 pounds, will fall the same distance, in the same time; for each pound in the heavy ball is acted upon in the same manner, and in the same degree, with the ball of one pound; and the heavy ball may be said only to represent 100 balls, of one pound each. All this is true; but a lecturer on natural philosophy would be considered as deviating from orthodox principles, if he addressed his audience to the following effect:——

"The ball which you see on the table before you, weighs one pound;

and, consequently, it is drawn towards the earth by the attraction of gravitation, with a force of one pound, which causes it to fall 16 feet, in a second of time; and if the attraction of gravitation were increased 1000 times, drawing this same identical ball towards the earth, with a force of 1000 pounds, the velocity of its fall would not be in the least accelerated, thereby." This, however, is the point for which I contend; and the contrary is either implied, or expressed in every work I have seen on the subject. In a review, (of Captain Sabine's work, to determine the figure of the earth,) by Professor Renwick, written for the "London Quarterly Journal of Science and Arts," where the principle is of vital importance to the merits of the subject, we find the following passage: "this diminution of the intensity of gravitation will affect the rate at which heavy bodies fall to the surface of the earth, and the time of the oscillations of pendulums."

It is related of Sir Isaac Newton, that the laws of gravitation, and their universal applicability to all matter, were suggested to him by the circumstance of an apple falling from a tree, which caused him to institute the inquiry, why it should fall? But it appears to me, that the circumstance might have been pursued farther, and have led to the question, why it should fall 16 feet in a second? and that not only the *fact* of the fall, but the *rate*, would have been found equally to pervade the universe; for, if I am correct in my ideas on this subject, the earth, if divested of the motion in its orbit round the sun, and, consequently, of its centrifugal force, would fall to that body, under the same law, and commence its career at the same rate, as an apple falls from a tree, viz. 16 feet the first second, &c.&c.

A pendulum is governed by the law of falling bodies, and the *inertia* is always as the *gravitating force*—for it is by the gravitating force that it falls from a given height in the arc of its vibration, to its lowest point,—and by the inertia that it rises to the same height from which it fell.

The quantity of matter contained in a pendulum, does not alter the times of its vibrations, by the law quoted as governing falling bodies.—If a pendulum of given length, (say 39 inches) and weighing ten pounds, vibrating seconds, at the surface of the earth, be supposed to be taken to a point towards the centre of the earth, where it should weigh only five pounds, (tried by a spring, or some invariable standard) its length remaining unchanged, it would still vibrate seconds; for, as regards the operation of gravitation, it would then be similarly situated to another pendulum, at the surface of the earth, of half the weight of the first.

If this view of the subject be correct, there is but little chance of gaining a difference of vibrations, by the loss of 1-259th part of the gravitating force, occasioned by that of the centrifugal force at the equator.

I find the idea which generally prevails, when considering the effect of a pendulum being subjected to an increase of gravitating force, to be the same as imagining an additional weight suspended by a

thread to the *bob* of the pendulum, whereby the vibrations would be quickened, and shortened; for the suspended weight does not describe the arc of a circle, having its greatest velocity at the lowest point, and thereby enabling it to attain the height from which it fell.

The operation of a pendulum, so situated, is, however, worth examining, for each vibration is shorter, and quicker, than the preceding; and it would thus continue (in theory) to vibrate *forever*, affording a beautiful illustration of the infinite divisibility of both time and space.

The results of the experiments on the pendulum, to determine the figure of the earth, are various, and unsatisfactory, as indeed they must be, when we consider the source from whence they are derived.

I do not deny the general fact, of the vibrations of the pendulum, being slower near the equator, by the diminution of gravitating force; but it is not caused on the principles commonly supposed. The motion of a pendulum, is sustained, and the friction overcome, generally, if not universally, by the falling of a weight, in the manner of a clock weight.—Now here is a certain office to be performed, or work to be done, in a given time, which is accomplished by the falling of a certain weight in a given time, equal to the task. If a pendulum, so adjusted at London, be taken to the equator, the power (the weight) to do the work is no longer the same; and it by no means follows, that the work to be done (friction to be overcome) has decreased in the same ratio with the power to do it: therefore, from this vague, and varying cause, the vibrations will be slower.

T. W. B.

Cincinnati, 9th May, 1827.

Perkins's Steam Engine.

We have seen this engine repeatedly in action since our last notice of it, and to all appearance giving great satisfaction to those who have visited it; there has not, however, yet been exhibited any demonstration of the actual amount of power which it is capable of exerting, nor do we consider that its present situation, in Mr. Perkin's factory, is at all favourable to such an experiment. The public must, therefore, for the present, be satisfied with such inferencial proofs, of its capabilities, as may be drawn from a consideration of the amount of friction exerted upon the fly-wheel, by the weighted lever described in our former report.

We have seen a testimonial given, for some private purpose, by several respectable engineers, whose names however, we do not feel ourselves at liberty to publish, without authority. It was to this effect:

"We, the undersigned, having made ourselves practically acquainted with Perkins's high pressure, safety, steam engine, do not hesitate to state, that he has established the following new and important facts

in the construction of his engine. 1st, Absolute safety. 2nd, Greater economy in fuel than in any other engine hitherto invented. 3d, The removal of all the re-action of the steam, and atmospheric air, on the eduction side of the piston, without the necessity of an air pump. 4th, A new and simple flexible metallic piston, requiring no oil, or lubrication, whatever. 5th, A reduction of three fourths of the weight and bulk, by very much simplifying certain complicated parts of steam engines, and substituting a very simple eduction valve, for the one commonly used both for eduction and induction. By which means, a reduction is made in the size of the engine; a saving of power is effected, and a diminution of friction; less wear and tear occurs, and less destructibility of materials. And lastly, the joints, by Mr. Perkins's peculiar mode of connecting, are more easily made secure, and tight, even with the steam at the pressure of 1000lbs. to the square inch, than the joint of the low pressure condensing engines."

This is all the information, that we are at present enabled to afford upon this interesting subject; the specification will not be enrolled until September, we shall then take the earliest opportunity of laying the invention before our readers, with all its details, and in the mean time, should any further information transpire, we shall not allow it to pass unnoticed.—[*Newton's Journal.*

Account of the Conflagration in the Quicksilver Mines of Idria, in 1803.*

In 1803, on the night between the 15th and 16th of March, the workmen observed a thick smoke issuing from some of the lower galleries. It ascended, and spread itself through the higher. No fire was seen, no sound of flames was heard, but it was too evident that the mine was on fire, below. Some of the workmen, with great intrepidity, endeavoured to reach the scene of the conflagration. It was in vain; they were forced to retreat from one gallery to another, flying before an enemy whom they could not discover; for the smoke, which continued to make its way upwards to the open air, was not merely so dense and suffocating, but so loaded with noxious fumes, and particles let loose from the fossils among which the flames were raging in the bowels of the earth, that no living creature could safely meet it, much less penetrate it. They were fortunate enough to save themselves above ground, and the idea was adopted of extinguishing the fire by excluding the air. All the passages were closed as near to the supposed scene of the conflagration as they could be reached. The two shafts, which lead immediately above ground, were stopped up, outside, and plastered over with clay. Five weeks

* A very complete account of the Quicksilver Mines of Idria, will be found in the *Edinburgh Encyclopædia*, Art. Idria, vol. xi. p. 149. *Am. Edit.* The accompanying account of the conflagration, which is not given in that work, is taken from Russell's *Tour in Germany*, vol. ii.

the mine remained thus sealed up, but without effect. Twice, during this period, the coverings above, were removed; each time, the enemy was found more furious than before. The flames were heard raging below, with a sound at which the miner still trembles when he relates it; the smoke, burdened with mercurial, and sulphurous exhalations, rolled forth from the mouth of the pit, like streams from the jaws of Acheron, striking down every one that came within its reach. It was apprehended that the fire had attacked the upper works, and was thus threatening the final destruction of the mine. As a last resource, the director resolved to hazard the experiment of laying the mine under water. A stream was turned into the perpendicular shaft, and allowed to flow two days, and three nights. During the first day it produced no effect. In the course of the second day, whether it was that steam, generated by the meeting of the fire and water, was struggling for escape, or that an inflammable air had been produced and kindled by the glowing fossils, of a sudden, a subterraneous explosion shook the mountain with the noise and violence of an earthquake. The huts of the miners, situated near the entrance, were rent; houses farther off, but standing on the slope, or near the skirts of the hill, started from their foundations; and the panic struck inhabitants, were flying in dismay from the ruin that seemed to threaten their valley. The whole thing must have been splendid; accidental as it was, art could go no farther in imitating nature. In the mine itself, as was afterwards found, the explosion had rent the galleries, thrown down the arched roofs, and torn up the stairs. But the victory was gained; the vapours began to diminish, and, at the end of some weeks, it was possible to venture into the mine. It cost two years to prepare an apparatus, and pump out the water. It was carried off into the Idria, and was found to contain only a small quantity of mercury, but a large proportion of vitriolic acid, and so much iron, that the bed and banks of the river were encrusted with iron ochre, throughout its whole course, from Idria, to where it falls into the Lisonzo. At the same time, every fish disappeared from the stream excepting the eel, which seems to bid defiance to every thing except actual broiling or roasting.

Even when the galleries had been cleared of the water, it was impossible to work in them, partly from the heat which they still retained, but still more from the fumes of sublimated mercury, which produced in the miners a violent salivation, accompanied with convulsions and trembling of the limbs. To produce an almost inhuman zeal, high wages were offered to such as would venture into places reckoned the most dangerous, to explore the consequences of the disaster, and collect the quicksilver which had been deposited in large quantities in the galleries. Many purchased this additional pittance with their lives; and altogether, the atmosphere which continued for months to infect the mine, was so baneful, that it was difficult to muster a sufficient number of healthy men for ordinary operations.

[*Brewster's Journal.*

Remarks on Prof. Eaton's proposed improvement in the manufacture of Compass Needles. By a SURVEYOR.

TO PROFESSOR SILLIMAN.

THE last number of your valuable Journal contains an article entitled "Improvement* in the manufacture of Compass Needles, by Prof. Eaton," which from the importance of the subject, I was induced to read with much attention. After I had done so, however, I was somewhat surprised that the author should have denominated that, an improvement, which, at best, could be nothing more than a method of repairing a defective or damaged instrument.

It appears from Mr. Eaton's statement, that he was led to this discovery in examining a compass of fine workmanship, which had been returned to the maker as an imperfect one. A series of experiments proved that the cause of the defect, was the lodgment of a small scale of steel in the limb of the instrument. This, of course, would have an effect upon the needle, and thus destroy its accuracy.

To remedy this defect, Mr. Eaton caused the needle to be cut off $\frac{7}{10}$ of an inch from each pole, and to be armed at each extremity with brass tips; after which, we are told, the instrument was perfect. This method, seems then, to be recommended to general use, as it is said that "another important advantage which will attend tipping needles with silver, brass, &c., is that of preserving the points from rust. It has been demonstrated by conclusive experiments, that magnetism resembles electricity in acting most powerfully from the sharpest points."

I may remark, that, although it has been rendered probable, that most metallic bodies possess magnetism, the only substance in which it is strikingly, and permanently developed, is steel; and hence this is altogether employed for the construction of magnetic needles. This being the case, my objections to Mr. Eaton's proposed improvement are,

1st. That the needle possesses the weight, and, consequently, the friction of a long one, with only the magnetic power of a short one; it having been sufficiently proved, that the friction is nearly proportional to the weight of the needle.†

2d. That in the construction of magnetic needles, those are the best, in which the opposite magnetisms exist in each half, gradually increasing in intensity, from the centre to the extremities. But this is not the case, when the ends are tipped with brass, in which, if any magnetism is developed, it may be of another kind from that which exists in the steel to which it is attached. Such a needle, therefore, is liable to the objections which would apply to one having consecutive points, or which assumes polarity, in parts other than the extremities.‡

* This title was written by the Editor.

† See Biot, and other authors on magnetism.

‡ A very convenient method of ascertaining this fact, is to detach the needle, cover it with a clean piece of paper, and then sprinkle on the paper some fine iron filings. We can then detect the number and exact position of poles of the needle.

For these reasons, I cannot but think that the method suggested by Mr. Eaton, must greatly impair the directive force of the needle, and that its adoption would be injurious, rather than beneficial; we are therefore at no loss to account for the circumstance stated by him, that the needle, when thus tipped, was not affected by magnetic ores, *real* or imaginary.

A remark or two as to the particular case which led to the use of these brass tips. If a scale of steel or iron was lodged in the plate, it is difficult to perceive how the simple shortening of the needle would completely obviate the disturbance which this might occasion. It might render the error less manifest, but could not wholly correct it.

As this subject is one of much consequence, particularly in this country, where the compass is so much employed, I will venture to add a few suggestions, which, in my opinion, will be more likely to improve the manufacture of compass needles, than the method proposed by Prof. Eaton.

A person, upon purchasing a compass, if he wishes to obtain an accurate instrument, should test every part of the plate, limb, &c. with a fine magnetized sewing needle, suspended by a fibre of silk. If this is not at all affected by passing the different parts of the plate, under it, it may be inferred that there is no point of attraction. But if it is affected, we can easily detect the exact spot in which the iron, or steel, is lodged. In the latter case, the better way is to select another instrument, and treat it in the same manner; and so on, until one shall be found, which is entirely free from objection. This rigid scrutiny might indeed increase the cost of perfect instruments, but this is of little consequence, in a matter where accuracy is all important. Above all, no principle of *justice* would warrant the *punishment* or *injury* of the needle, for a fault of the plate.

As to the best form of compass needles, there is still some dispute; Capt. Kater preferring the pierced rhombus, five inches in length, and two in breadth,—Coulomb, and others, the arrow-shaped, &c. In one thing, however, most experimenters agree, viz. that they should be pointed; as by this means the highest degree of magnetism is developed and maintained in the extremities, which is the grand desideratum in the construction of magnetic needles. How can this object be effected if these extremities consist of brass, or silver?

Finally, I imagine that it will be much easier to keep a common needle, properly pointed, and free from rust, than it will be to obtain one of equal directive power, upon the plan proposed by Professor Eaton.

A Surveyor.

[*Silliman's Journal.*

On Magnetising Steel by the direct White Light of the Sun. By Mr. A. Baumgartner, *Professor of Natural Philosophy at Vienna.**

On repeating, last summer, the experiments of Mrs. Somerville on magnetising iron by the influence of the coloured light of the sun, I found out a process which succeeds sooner, and more certainly, than that of M. Morichini, and of Mrs. Somerville. It has led me to this result; that a piece of steel of the size of a common knitting needle, of which one or several places are polished, and the others unpolished, being exposed to the direct white light of the sun, acquires a north pole at every place where it is polished, and a south pole at every place not polished. The following is the process.

I took a wire of English steel, the size of a common knitting needle, and heated it so as to cover it entirely with black oxide. I afterwards took off the oxide, in one or more places, by means of an oil-stone, and I finished the polish with chalk and lime-tree wood, so as to form brilliant zones, about two, or three lines long. The steel thus prepared, exposed in a place perfectly lighted by the sun, was found, after a little time, strongly magnetic in the way indicated. The time, all other things alike, appeared to depend on the intensity of the solar light; for when I concentrated the solar light on the polished zones by means of a lens, I succeeded in producing in a few minutes, a magnetism which would have required several hours, with the natural intensity of the sun.

A piece of steel polished only at one end, takes a north pole at that extremity, and a south pole at the other. If the polished place occupies the middle, the two ends take a south pole, and the middle, a north pole. If the wire is, on the contrary, polished at both ends, these take a north, and the middle, a south pole. Lastly, if the wire has several polished zones, each of them acquires boreal magnetism, and the dull zones, separating them from one another, acquire austral magnetism. In this way, any number of magnetic poles may be developed, provided the steel wire be of a length proportionate to the number of poles desired. I have thus easily obtained eight poles, on a wire eight inches long, although of unequal intensity. I have constantly found that the extreme poles were stronger than the others, and that they longer retained their magnetism. I have not been able to succeed, by the same method, in magnetising steel wire wholly covered with oxide, or perfectly polished, nor other wires having polished stripes in the direction of their length. All the results above-mentioned, remained the same, in whatever manner the wire was placed with regard to the points of the compass. Every experiment was repeated several times, without giving different results. I need not say, that, before exposing every wire to the solar action, I carefully examined whether it was magnetic, or not, and that the experiments were made with wires not magnetic.

* From Annales de Chimie, xxxiii. 333. Nov. 1826.

On Annealing Cast Steel, so as to make it as soft as Iron.—By Jacob Perkins, *Esq.*

We were lately shown by an American friend, some slips of thin cast-steel, which were as soft and pliant, and as easily bent into any required shape, as though they had been tinned sheet-iron. They were of a light gray colour, perfectly free from oxidation or scales, and were still capable of hardening, on being heated and quenched in water.

On mentioning this fact to Mr. Perkins, he stated that the process was known to him, he having practised it in America with great advantage; and he had even communicated it to one intelligent engineer in this country, who had since constantly employed it.

The secret consists in inclosing the cast-steel in close cast-iron vessels, which completely exclude the external air; and in keeping them at a moderate red heat, in a proper annealing furnace, a sufficient length of time, according to the thickness of the steel; and, lastly, letting them cool very slowly.

This process is superior to the usual practice of decarbonating cast steel, and reducing it to the state of iron; which renders it necessary to restore its steely nature again, by case-hardening it, before it can be hardened as usual. [*Tech. Rep.*

On Annealing Iron and Steel Wire.—By Thomas Gill, Esq.

Although "the annealing of cast-steel in close vessels," as described to us by Mr. Perkins, and as given in the preceding article, was a new and valuable fact; yet we well knew that a similar practice had long been used, both in this country, and in France, for annealing iron, and steel wire.

The late scientific M. Nicolas Paul, of Geneva, described to us, twenty years since, the practice employed in an iron wire drawing manufactory in France, to anneal their wire; which was by enclosing the large coils, in cast-iron vessels of an annular or ring shape, open in the middle, to allow the flame of the furnace to play through them; and the section of which rings was a semi-circle, having flat cast-iron rings, as covers to the flat tops of the vessels. Ears were made around the internal, and external borders, both of the vessels and their covers, with corresponding holes in them, into which wrought-iron pins, with heads, were put, and which pins had also holes near their ends, through which iron wedges were driven, to draw the covers close to the vessels, the juncture being previously made air-tight by a luting of loam. These vessels were heated in a kind of oven-shaped furnace, having a grate of iron bars, for the fuel, and vessels, to rest upon, with doors both to the oven and ash-pit.

We also saw, about the same time, the method employed by the late Mr. John Burr, at his steel wire works, near Hales-Owen, in Shropshire. He enclosed his bundles or coils of steel wire, for needle and

fish-hook making, in cast-iron vessels, with covers fitted closely to them, to exclude the air. These vessels were uniformly heated in a cylindrical furnace of brick-work, covered with a dome, and having a hole in the centre of the dome, to serve as a chimney. The furnace was strengthened by a number of projecting buttresses, which were built around it, and by iron chains surrounding the brick-work. The fire was made upon a circular grate, which ran all round the inside of the furnace, and was supported upon walls; air-holes to supply the fire being also made at regular distances through the external wall of the furnace. A door of brick-work was built up, after the coal fire had been lighted, and the vessels containing the steel-wire, had been deposited in the furnace; this of course, was taken down again after the annealing was performed, and the furnace had become sufficiently cool to remove the vessels.

In Cadell's "Journey to Carniola, Italy, and France, in the years 1817 and 1818," he says, vol. i. page 243, that in the iron wire works, near to Pistoja, in Italy, "after the wire has been drawn, it is hard; and, in order to restore its flexibility, it must be heated, and suffered to cool, gradually. For this process of annealing, large cast-iron vessels are employed, four feet high, in form of a truncated cone, with the base uppermost. The wire is put into the vessels, which are then covered and luted tight. The vessel is surrounded by a brick-wall, at some distance from its sides, and burning charcoal is put in, between the vessel, and the wall. These cast-iron vessels are made at the furnaces in the Maremma, and they are almost the only articles of cast-iron I observed in Tuscany."

In our first volume, page 423, we mentioned, that Mr. Corcoran, of Mark-lane, wire weaver, inclosed his wire in closed cast-iron vessels, *surrounded with ground flint*, and then exposed them to a red-heat, in proper furnaces. And that, although the wire thus became quite flexible and pliant, yet it was as bright as though it had not been heated at all. [*Ib.*

Remarks by the Editor.—We had been so long familiar with the foregoing process, that we had supposed it to be the universal practice in wire manufactories. The Messrs. Sellers of this city, have used it for many years; it was also followed by Messrs. White & Hazard, at their wire drawing manufactory, at the falls of Schuylkill, and by many other persons in this country; but as it may be new and useful to some persons who work in wire, we have re-published it.

On the proper Method of casting the Rims, or Felloes, and the Naves of Wheels in cast-iron, and affixing wrought-iron spokes in them.—By Jacob Perkins, *Esq.*

In the ordinary method of doing this, the wrought-iron spokes are laid in their places, in the sand moulds, and the melted cast-iron is

poured in at the same time, both to form the rim, and the nave. The consequence of this evil practice, is, that the rim, in cooling, shrinks; and as the spokes are fixed immoveably in the nave, they cannot move inwards as they ought to do, and the rim, of course, breaks.

Now, in order to avoid this misfortune, we have only to cast the rim first, and allow it to become quite cold, whilst the spokes are at liberty to move in the mould, during the time the rim is cooling; the nave may then be cast, and the wheel will remain perfectly sound.

[*Ib.*

Account of an Improved Felt Polisher for the Lathe, invented by the late Mr. Wm. Allen. By Thomas Gill, Esq.

Mr. Allen, an excellent workman in the manufacturing of ivory, and tortoise-shell, into a great variety of beautiful articles, such as tea-caddies, snuff-boxes, &c. had constant occasion to give a fine polish to his works, in finishing them. He generally employed polishers made of felt, with the finest rotten-stone and oil, as usual, for this purpose; but in those used in the lathe, and which were of a narrow cylindrical form, with their rims and peripheries covered with felt, by gluing a band of it upon them, he found great inconvenience, to arise from the gap left between the ends of the felt, occasionally receiving into it particles of gritty matters which continually arose, and caused scratches in his works, which he had great difficulty in afterwards removing. After suffering this inconvenience for years, he at length fortunately hit upon a method of *clothing his polishers with entire rings of felt*, free from the above evil, by employing *the sides of the crowns of hats* for that purpose. One hat-crown thus cut into rings, affording the material for clothing several polishers.

He had, indeed, great reason to congratulate himself upon this fortunate discovery; and when we consider how many artizans are under the continual necessity of employing similar polishers, in the finishing of their different works, we conceive that we are rendering them an essential service, in making this communication.— [*Ib.*

Notice of some Showers of Fishes, in various places in Scotland; and of Shells in Ireland.

Shower of Fishes in Argyleshire.—The rare occurrence of such falls, renders them so remarkable, as to be remembered after long intervals of time, and even after every circumstance connected with them is forgotten. When any phenomenon is not considered in its relation to any particular cause, few will attend to its possible relations to preceding events; and fewer still will esteem it of such importance, as to treasure up the observations which they might have happened to make, even although these might be of great importance, in illustrating the nature, and causes, of the circumstance observed.

It is thus, that, though the testimony of many has enabled me to ascertain, that a shower of herring-fry fell in Lorn, about the year 1796, yet I have not met with any, who could inform me of the particulars concerning it.

In the same district, and near the same place, on a small eminence above Melford House, a shower of herring fell in 1821, in every respect so large and good, that the tenants, by whom they were found, were induced to send some of them to their landlord, then residing in Edinburgh. In regard to the state of the weather, I could learn no more than that it was exceedingly boisterous; while the hill on which they were found, is exposed to the south-west wind, which blows along Loch Melford; an arm of the sea in which herrings are frequently found, and, as far as I know, the only one in this quarter, in which the fly is commonly, and successfully used in fishing for them.

In the month of March, 1817, strong gales of wind from the north, were experienced in Appin. Upon the evening of the second day of their continuance, rain fell in abundance; and, the next day being very warm and sultry, some children observed a large quantity of herring-fry, scattered over a moss, a little to the north-east of the ferry of Shien. There might have been about three barrels, or more, of these, and measuring from 1½ to 3 inches in length. Now the place in which they were found, is only about 300 yards north of Loch Creran, an arm of the sea, running east and west, from which, several persons supposed the fry must have been raised. The wind, however, being from the north, renders this a seeming impossibility; and it may, perhaps, be more safely concluded, that they must have been ejected from the Linnhe Loch, another arm of the sea, extending south-west and north-east, about three miles north of the place in which they were found. A range of moorland, about 300 feet above the level of the sea, intervenes; but it is easier to suppose the cause which originally elevated these fry, to be so powerful as to carry them this height, and distance, than that they should obtain a course contrary to the general body of the air. They exhibited no appearance of being bruised by the fall, nor was there any thing which could induce the belief that water had fallen at the same time.

Letter Rev. Colin Smith, of Appin, to the Editor.

Shower of Herrings in Galloway.—Macchirmore, or the head of the Macchirs,* for indeed there is not much white ground above it, pertains to Dunbar of Macchirmore. It is situate upon the east side of the river of Cree, one mile distant, to the south, from the town of Monnygaffe; and here is the first ford of the water of Cree, except that betwixt Kirkmabreck and Wigton, of which more hereafter.

* Macharmor is not "the Head of the Macchirs," but the Great Machar, or level arable district. The Head of the Machars, would be Ceann-a-Mhachair. [*Edit.*

This ford is five miles, or thereby, *in recta linea*, to the northward, distant from Wigton. In the moors of this parish of Monnygaffe, not many years since, at a place called La Spraig, not far distant from the water of Munnach, but sixteen miles distant from the sea, there fell a shower of herring, which were seen by creditable persons, who related the story to me. Some of the said herring, were, as I am informed, taken to the Earl of Galloway's house, and shown to him.—*Andrew Symson's Large Description of Galloway*, 1684. *Edin.* 1823, *p.* 31.

Shower of Herrings in Kinross-shire.—Mr. Arnot informs me, that, about a year ago, a shower of herrings fell near Loch Leven; it came in the direction of the Frith of Forth, and the herrings are conjectured to have been blown out of the water of the Frith, and carried by the wind across Fifeshire, to the place where they were found, in the vicinity of Loch Leven.

Shower of Shells in Ireland.—I send you another instance of a shower of shells, which fell at Monastereen, in the county of Kildare, a few days ago. At this time, the tides were remarkably high, and the sea exhibited marks of unusual disturbance. I regret that I can send one only of these shells. [*Edin. New Phil. Journ.*

Account of a new Steam, and Heated Air Engine. By Minus Ward, *Civil Engineer, Baltimore.*

Mr. Ward having recently received from Europe his patent for his new engine, wishes to lay before the public an extract from his specification, which will describe the principle of its action.

Specification of new and economical methods of using heated air, gases, elastic fluids, and products of combustion, which are available to the increase of steam power.

These consist in employing or using, in whole or in part, the air which is *heated* while passing through the fire of the furnace attached to the steam engine, together with the heated gases, elastic fluids, or products, set at liberty, or given out by the burning fuel in the same. By means of sundry appliances and machinery, which are added or affixed to the steam engine, to *force* or *throw into* the boiler, either below or above the surface of the water in the same, the aforesaid heated elastic fluids, or products of combustion, thereby causing them to mix or unite with the steam. Thus availing myself of the caloric and agents, which are ordinarily suffered to escape through the flue or chimney into the atmosphere, and are lost. This may be put into practice by an indefinite variety of methods.

One method is, to place a pneumatic forcing pump, which we will call the *gas-pump*, on the top of the boiler of the steam engine; a pipe, or tube, extends up from the furnace below, through the water and steam in the boiler, and enters the bottom of the gas-pump chamber, where there is a valve opening *upwards*. By the side of this valve, there is another valve opening *downwards*, into the cavity

of the boiler. The piston of the gas-pump is driven by the engine. From the upper part of the boiler, commonly called the steam chamber, a pipe extends to the steam, or working cylinder of the engine, which cylinder is of a construction no way different from that of the steam engine in common use.

Operation.—As the piston of the gas-pump rises, the valve which opens upwards will be forced open by the laws of atmospheric pressure, causing the heated elastic fluids and products of combustion to follow the piston. The other valve being kept closed by the pressure of the steam in the boiler, the heated air, gases, and other heated products of combustion, rise from the burning fuel in the furnace, and passing up through the pipe and the valve, fill the chamber of the gas-pump; the cubic contents of which may be to those of the steam, or working cylinder, as 169 to 256, or thereabout. On the descent of the piston, the inlet valve closes, and as soon as the descent of the piston, by compressing the heated air, gases, and other heated products of combustion contained in it, causes their elastic force to become greater than the elastic force of the steam in the boiler, the valve in the boiler opens, and the contents of the gas-pump are driven into the boiler, at a temperature nearly equal to what it was in the furnace; where, coming to an actual contact, and mixing with the steam, they give out a portion of their caloric to the steam, and the temperature of the mixture, will be higher than was that of the steam, before the injection of said gases. The increased temperature, will cause a corresponding increase of the elastic force; the mixture of steam and other heated elastic fluids thus formed, passes on to the working cylinder of the engine, where, after acting by their pressure upon the piston of that cylinder, they are either suffered to escape into the atmosphere, or they are conveyed to a condenser, where the steam and aqueous parts of the mixture are condensed, in the same manner as steam in condensing engines. The water thus formed, the injected water, with the air, gases, &c. are pumped out together. The above arrangement of parts has been specified on account of the ease with which it may be understood.

Another modification, is to immerse the gas-pump in the boiler with its upper flange upon the top of the boiler. A tube, open at both ends, extends from near the upper part of the steam chamber, internally down along the side of the gas-pump, and enters the bottom of the same. By this arrangement, as the piston of the gas-pump rises, the chamber below the piston will be filled with steam, and as no valves are placed in this tube on the ascent of the piston, this steam will be returned into the steam chamber; the use of this is to keep the packing of the gas-pump continually damp, so as to prevent its being burned. The inlet and outlet valves are placed upon the top of the pump, the piston rod working through a stuffing box: a tube extends from the furnace, to the inlet valve, and another tube extends from the outlet valve, to the steam chamber. The gas-pump may be also placed, externally, on the end, or side of the boiler, and be a double acting pump, with a pair of valves, as before described, at each end thereof. In this plan, an elastic metallic piston may be adopted; one method of making which, is to substitute for the pack-

ing of hemp, a packing, or gasket of card-wire, which is applied in the same manner as the packing of hemp.

In the above methods, if it be intended to take into the gas-pump, a larger part, or the whole of the heated elastic fluids, and products of combustion, a damper, or valve, may be placed in the flue or chimney, above the tube leading to the gas-pump; which damper, after the engine is in operation, may be totally, or partially closed. If it be entirely closed, the draught and the consumption of the fuel in the furnace will be in proportion to the capacity of the gas-pump, and the number of strokes made by its piston in a given time.

On the Preservation of Zoological Specimens, from the depredations of Insects. By Thomas S. Trail, M. D. F. R. S. E. &c.* *Communicated by the Author.*

The difficulty of preserving zoological specimens, from the depredations of insects, is a subject of regret and anxiety to every collector; and various methods have been proposed of accomplishing this desirable object. The compositions into which *arsenic* and *corrosive sublimate of mercury* enter, are well known to be very effectual, when properly applied; but, unless used with caution, they are apt to injure the natural pliancy of the skins, and they can scarcely be effectually employed to protect collections of insects. I have known these substances, even in the hands of the most expert, produce such tenderness of the skins impregnated with them, as to form a considerable obstacle to the *setting up* of specimens. To render them effectual, too, they must be carefully applied to each specimen; by which the labour of collecting, and preserving, is considerably increased.

Every substance which I have yet tried, seems to be inferior in efficacy, and ease of application, to the following,—the method of Mr. William Gibson, preparer of objects of Natural History, residing in No. 16, London Road, Liverpool; which I shall transcribe from his own communication to me.

"I have found" says he, "that nothing destroys insects so effectually as *rectified oil of turpentine*, and my method of using it, is as follows: I put the turpentine in a bladder, the mouth of which is firmly tied with a waxed string; and nothing more is necessary, than to place the bladder, thus prepared, in the box with the birds, or to tie it to the pedestal, on which the birds are perched, in a case. If there be any maggots on the birds, I have invariably found, that they will soon be dislodged from the feathers, fall to the bottom of the case, and die in the course of two days. I have also made the experiment of introducing the common house-fly, the large blue-bottle fly, and moths, into a case of birds, so defended, through a small hole in the bottom of the case. The moment the flies enter the box, they begin to vomit a whitish, glutinous matter; they are much agitated, and the largest of them die in seven minutes. I have, in like manner,

* The method of preserving zoological specimens by Dr. Trail, we have been in the practice of employing to great extent, and most successfully, in the Museum of the University, for a considerable time past.—*Editor.*

repeatedly introduced active American cock-roaches, and these strong insects soon became uneasy, often rubbed their sides with their hind-feet, and died in about an hour and a half. I next got a bird skin full of living maggots, and placed it in my defended case; in about three hours they were seen *coming out* in all directions, and fell to the bottom of the case, where they died. For large cases of birds, a pig's or a sheep's bladder is sufficient; for middle-sized cases, a lamb's or a rabbit's bladder will do; and for small ones, we may use a rat's bladder. The turpentine evidently penetrates through the bladder, as it fills the case with its strong smell."

The powerful anthelmintic effect of oil of turpentine, corroborates Mr. Gibson's account of its poisonous quality to the larvæ of insects; and its instantaneously killing perfect insects, must be familiar to the entomologist. I may here remark, that I have found the common receipt of dipping the pin, with which the insect is to be transfixed, in aquafortis, is by no means so speedy a method of putting an end to its sufferings, as applying a single drop of turpentine to the corselet. Though disappointed in the use of the pin dipped in acid, I never found the largest insects, *Libellulæ*, *Scarabæi*, *Blattæ*, or *Scolopendræ*, that could, for a moment, resist the application of the oil of turpentine.* I ought to add, however, that my entomological pursuits have been but few; for the difficulty of speedily killing insects, without injuring the specimens, early gave me a distaste to that branch of Natural History.

The difficulty of destroying the minute white *acari*, that infest the hairs of specimens in collections, is well known. On the neck of a large specimen of *Phoca leonina* (Linn.), in our Museum, I lately observed innumerable *acari*. I directed the skin to be carefully washed with a strong solution of corrosive sublimate, in spirits, seemingly without much effect. Some of them even crawled among the hairs, while still wet with this solution; but on brushing the part infested by these vermin, with oil of turpentine, they speedily disappeared. [*Edinburgh Journal.*

Notice regarding Steatite or Soap-stone, and its principal uses.

Steatite is, as is well known, a variety of the talc genus. Its colour is white, green, or gray; it is also sometimes, though rarely, red and yellow. Its specific gravity varies from 2.60. to 266. It is a compound of silica alumina, magnesia, oxide of iron, and water, which vary according to the locality. It is very common in Cornwall and Germany. As it is fusible only at an exceedingly high temperature, and is easily wrought, excellent crucibles may be made of it, which are further hardened by fire, and which are only with great difficulty penetrated by litharge. It is also employed in making moulds for casting metals. In England it is used in the manufacture of porcelain. M. Vilcot, an artist of Liege, made several trials of it, with the view of finding out whether it might not be susceptible of being em-

* I have seen several coleopterous insects, swimming about for some time in strong spirits; but immersion in oil of turpentine was uniformly and speedily fatal.

ployed by the lapidaries. He prepared cameos of this substance, the colour of which he brightened in the fire, and which he rendered so hard, by the elevation of the temperature, as to give sparks with steel. They were then coloured, yellow, gray, or milk-white, by different solutions. He polished them upon the stone, and ended with making them assume all the lustre of agate. Some pieces even resembled onyx, in colour; but a serious inconvenience was, that the markings were easily altered by the fire, and could no longer be restored. Steatite has a great affinity for glass; it is also employed, in the manner of paste, reduced to a fine powder, and mixed with colouring matters, for painting upon this substance.

It also serves as a sympathetic crayon for writing upon glass; the traces seem effaced, when a piece of woollen is passed over them, but they re-appear immediately, when moistened by the breath, and again disappear when the glass becomes dry. Steatite is not so easily effaced as chalk, and does not, like that substance, change its colours. Tailors and embroiderers also, prefer it to chalk, for marking silk. It possesses the property of uniting with oils and fat bodies, and enters into the composition of the greater number of balls which are employed for cleaning silks and woollen cloths; it also forms the basis of some preparations of paint. It is employed also for giving lustre to marble, serpentine and gypseous stones. Mixed with oil, it is used to polish mirrors of metal and crystal. When leather, recently prepared, is sprinkled with steatite, to give it colour, and afterwards, when the whole is dry, it is rubbed several times with a piece of horn, the leather assumes a very beautiful polish. Steatite is also used in the preparation of glazed paper; it is reduced to a very fine powder, and spread out upon the paper; or, it is better to mix it previously, with the colouring matter. The glaze is then given to the paper with a hard brush. It facilitates the action of screws, and from its unctuosity, may be employed with much advantage, for diminishing the friction of the parts of machines which are made of metal. [*Ib.*

Notice of a new application of metals as a coating for Iron, Steel, Copper, &c. And also, of a new Gold coloured metal, manufactured in Italy. Extracted from a letter written by Thomas Appleton, Esq. American Consul at Leghorn, to James Mease, M. D. of this city.

"A FRIEND of mine has invented a metallic alloy, which is applied with ease, and at little expense, to all kinds of iron work, and which effectually protects it, for ever, from rust; it amalgamates with the iron, penetrating it to some depth. The colour approaches to that of plated ware. Wherever there are defects in the iron, from the presence of earthy particles, or other causes, the application will not seize on such parts, but forms a perfect covering wherever the metal is sound, from which it never separates. The invention has been approved by the academies of Paris, Turin, Milan, Rome, and Bologna, where the inventor has obtained patents. I have pieces of

iron, which have been buried in the earth for several months, without any other effect than the tarnishing the surface in a slight degree, and which is readily removed by rubbing with fine sand and water. It forms a beautiful covering for iron bedsteads, rails, or gates, and indeed almost every kind of iron work."

"A company is formed at Bologna, with a capital of 100,000 dollars, for coating iron work; and they are now drawing out plates, to form, if I may so say, a new species of tin plate, very superior to the old kind; for the metallic application adheres so firmly, that the work when broken, may be re-heated, and joined as easily as any other iron, without injury to the coating, which is not the case with tin. I send you a printed prospectus from the manufactory; and in order that you may have a more perfect conception of the thing, I send you two iron bedsteads, highly filed, and covered with the composition. I purchased them for this express purpose; the price, at the manufactory, is fifty dollars each, with their pillars, ornaments, &c."

"The inventor sends you, as a further sample of his coated iron, a little sofa, about 18 inches in length. It is the exact model of one sent to our Grand Duke, a few days ago."

"Four ounces of metallic composition, is sufficient for covering a bedstead; twelve ounces are valued at about a dollar and fifty cents. My pen-knife, and scissors, are covered with it, and their edges in no wise injured."

"I now call your attention to another invention of the same individual, not, perhaps, so essentially useful, but nevertheless, very beautiful and ornamental. This is a yellow metal, so perfectly resembling pure gold, that my snuff box, which is made of it, has certainly never been suspected to be other than the purest gold; it is of the same weight, within a fraction, and answers on the touchstone, to gold of 18 carats—it can be made like that of 24. This metal also is included in the manufactory at Bologna. They make there metal buttons, which are as beautiful as those most highly gilt, when new; but they have this preference, that they are eternal, and may be left in your will to your children's children, as they are made of the solid metal, of the same colour throughout. Gilt buttons, you well know, lose their covering of gold, and leave a disgusting disc of brass, before the coat is half worn out. This is strikingly the case with the buttons of our naval officers. Those of the new manufactory, may be purchased at 50 cents per dozen. Such a manufactory would be of essential importance in the United States; and very beneficial to any manufacturer who should procure the art of compounding the metal. The inventor sells it to the manufactory at Bologna, at two dollars and sixty cents, for the pound of 12 ounces, which quantity will make 9 dozen of coat buttons. But it is not confined to the making of these, but is used for watch cases, and every sort of ornament to which gold is applicable; I have in use, desert knives and forks, and fruit and coffee spoons, which are truly beautiful. This metal, the inventor calls ARTIMOMANTICO, as you will see by the prospectus."

"In order that you may see, and believe, I send you three desert sets of this metal, in all 144 pieces; they cost here 40 dollars the set."

"The inventor, who is my particular friend, informs me that he would sell the art, which is possessed by no one but himself; the ingredients, he says, are simple, and found in every country. To me, it appears a thing of great importance, and should any of my countrymen wish to embark in it, I would lend all the aid in my power."

The prospectus which accompanied the foregoing account, adds but little to the information contained in the letter; we will however, make one extract, which is as follows:

"This application is a kind of mixture, resulting from the union of many metals, and which possesses the important property of refusing to unite with oxygen at common temperatures, or even when artificially heated. It does not increase the thickness of the article to which it is applied, for whilst it incorporates with the whole surface, it does not cover the marks of the finest file, or in the slightest degree efface letters, or other marks. It does no injury to the temper of knives, nor can it be distinguished by the touch, on a piece of metal, to one half of which it has been applied."

We have examined the bedsteads, and the articles of imitation gold, which have arrived in this city; the former are deposited in the cabinet ware room of Cook and Parkin, Walnut, between Third and Dock streets, and the latter at Lewis Veron & Co.'s store, Chesnut near Third street, where they may be seen.

With respect to the material with which the iron is coated, it appears to us to be an alloy similar to some of the compositions of hard pewter, and we think, that it would require but few trials, to enable some of our intelligent workmen to imitate it perfectly.

The articles of *Artimomantico*, or gold coloured metal, are not fashioned to the taste of this country, but the object in sending them, was principally to show the colour and texture of the composition. The greatest objection to it, appears to us to be its softness, as we found that it would bend from the application of a very slight force

This alloy, it appears, was patented in France, in the year 1814, the patent there, must therefore nearly, or quite have expired, and the process have become public property; and of course, should the alloy, upon thorough investigation be found valuable, its composition may be known. We have seen many articles of gold coloured metals, both from France and England, quite equal in appearance to that in question, and superior in hardness; they however usually tarnish readily, and should the Italian compound be as free from this defect, as the account of it declares it to be, its superiority will depend upon this property.

Improved Brick-Kilns.

Mr. S. R. Bakewell of Wellsburg, Virginia, has made an improvement in the manner of constructing Brick-kilns, which, from the testimonials in its favour, appears to be of considerable value.

This plan has been put into operation in Baltimore, by the Messrs. Berry, and by Mr. George Warner, experienced brick-makers, who have given certificates in its favour: the former gentlemen say, "that

its merits equal, if not surpass their most sanguine expectations, and they are of opinion, that in such kilns, there will be a saving of time, fuel, and labour; *that both ends can be settled simultaneously, with as much ease as if they were fired separately.*" Mr. Warner, after observing that his experience in this business, has been for a period exceeding forty years, says, "that in the use of those kilns, by persons tolerably well skilled in the art of burning bricks, there will be a saving of time, fuel, and labour; that the burning of the bricks can be more certainly and easily conducted in windy weather, than in kilns of the common construction, as it appears that the heat, or fire, is entirely within the control and management of the burner, which is not the case on the old plan."

The following letter exhibits the views of the inventor, on the subject.

Dr. Jones,

Sir,—A short time ago I forwarded you copies of certificates, which I received from John and Thomas L. Berry, and from George Warner, Esqs. in behalf of my newly invented Brick-kiln. In this communication, I have taken the liberty to fill the deficiency, which appeared in their cautious and prudent statements, as to the precise amount of saving, or advantage which these kilns possess over the old ones, and although the kiln has been fired twice since those certificates were written, and both equally as satisfactory as the first, yet circumstances over which I had no control have concurred, to prevent me from proving to a demonstration the statements that follow. However, I will, in lieu thereof, give you as correct an opinion, as at present is in my power; and in the first place, I will assert with confidence, that I am well and perfectly assured, that by adopting these kilns, the gain in time and labour will be fully one third each; and in fuel, I am also equally certain (and will insure the purchaser of a patent right) a saving of one quarter of this essential, and in many places, expensive article; but it is my sincere and candid opinion, that after a little practice, the saving will be at least one third of the quantity made use of, or wasted, on the present plan; but the most important advantage that will arise from the use of these kilns, will be, by the increase in the quantity of the first quality brick, for instead of obtaining only about one third, or at most one half, of hard red ones, (fit for paving) from each kiln, as at present, experienced, and judicious firemen, such as the gentlemen before named, and many others, with whom I am acquainted, can, and will, soon augment the quantity of such, to nearly the whole contents of a kiln, excepting perhaps a loss only of from 1 to 2¼ per cent, including blue, black, salmon, and shattered ones; and as I feel perfectly conscious that this statement is not exaggerated, you are at liberty to publish either all, or a part of it in your valuable miscellany, should you think proper so to do.

I am, sir, your obedient humble servant,

S. R. Bakewell.

12*th June*, 1827.

Notice respecting the preceding and similar communications.

We will observe, that although it is one part of the design of this Journal to make known new inventions, discoveries, and improvements, it is principally intended to describe the mode by which any valuable end is attained; and that it will be expected from those persons who use our pages to announce their improvements, that they give, at once, such a description, as will make the thing clearly understood, or an assurance that it will be furnished at an early period. Where this is not intended, the announcement becomes a mere advertisement, and ought to be placed upon the cover. Where patents have been obtained, a copy, or abstract, of the specification, will answer our purpose.

ESSAYS ON LITHOGRAPHY.—No. I.

We have, in several instances, published individual processes, in the beautiful and important art of lithography; an art in which considerable progress has been made in the United States, but more particularly in Boston and New York, and we are informed that a lithographical press will soon be established in this city; an event, which for our own sakes, we shall hail with no small degree of pleasure, as it will afford to our work, greater facilities of illustration and embellishment, than those now at our command, and of which we shall gladly avail ourselves. We now commence a series of essays, which are intended to combine all the essential information which has been published upon this subject; we begin with an article on the kind of stones employed, and on the mode of polishing them, which we have translated from the last number of the *Journal des Connaissances Usuelles*, published in Paris by count M. C. De Lasteyrie, (son-in-law to Lafayette,) who has an extensive lithographic establishment, which is esteemed the second in that city.

On the Stones used in Lithography.

It is necessary to remark, that a lithographic establishment should be provided with stones of all dimensions, in order to enable it to execute work of all kinds. To the amateur, who has only one particular design, and who is satisfied with the lever press, of which we have given a description,* only a small number of stones is necessary. Two or three may suffice for him, who confines himself to experiments, or to one particular subject.

The country adjacent to that wherein lithography originated, is found abundantly provided with stones, suited to this art. There are immense quarries of it disposed in layers, along the Danube, in the country of Pappenheim, and in several other spots. The principal quarries wrought, are at a village called Solenhofen. Every one ad-

* Of this, a drawing and description will be hereafter given.

mitting the existence of a First cause, must believe, that Providence, who destined to this age the invention of an art favourable to the progress of civilization, had formed a considerable mass of stones, ready prepared for the service of lithography. They are in fact, found disposed in layers of one, two, three or more inches in thickness, in such a manner that it is merely necessary to cut them into convenient sizes, and to raise them from the quarries; their thickness being equal in all their strata. Nature, which knows neither privilege, or monopoly, has distributed the same benefit amongst other countries, though in a way less striking. Lithographic stones are found in France, Italy, Prussia, Spain, and in the United States. Researches made with greater care, would undoubtedly discover them in a greater number of places. France might do very well without stones from Solenhofen. The quarries discovered in the departments of the Indre, and in that of the Ain, and even in some other places, are sufficient for our necessities. All the lithographers of Paris make use, however, almost exclusively of those from Germany. The reason of this, is, that our quarries have been badly worked, either from want of funds, or from ignorance. The first masses which presented themselves, on the superficial strata, have been employed; these stones have been full of hollows, of veins, or other defects, though otherwise of a good quality: being harder than those of Solenhofen they are excellent for writings, for drawings in ink, and for line engravings. Those of the first quality, from Germany, are preferred for designs in crayon; those found in commerce, are not all equally good. The following are the properties which denote the goodness of a lithographic stone.

White stones are generally inferior to the other kinds, being less durable. Those of a yellowish, or rather a grayish tint, are to be preferred, on account of their durability, and because their grain is, generally, most equal. Those which are covered with points, or little whitish parts, resembling vermicelli, ought to be altogether rejected, especially when it is necessary to make delicate drawings in crayons; as the marblings, or shades of different colours, deceive the eye of the artist, and prevent his giving to his work, that effect, and harmony, which it ought to have. The strata with stripes of a more transparent tint than the general mass of the stone, ought to be rejected, not only because they are liable to split, but because they more readily take the ink in those parts, and leave the traces of it more strong, upon the designs. Stones, however, are met with, which have fine lines, or threads of a brownish hue, which do not present any impediment to the success of the artist.

Stones which are hard, and homogeneous, acquire a more equal surface, and are better adapted to the harmony of the tints; they give a greater number of impressions, without clogging, and furnish proofs more clear and more brilliant; whilst the contrary is the case with those which are softer: the durability of a stone may be ascertained by scratching it with the point of a knife. Those which are soft, retain with more difficulty the traces of the design in the light touches: they clog more readily, and, consequently, afford a smaller

number of impressions. The metallic pen cuts them easily, which produces a clogging and prevents the ink from flowing. The grain of these stones is always coarse and unequal. Those which have holes, or those which are unequal in their grain, or in their hardness, present the same inconveniences; they check the pen on the point, when employed in imitating line engraving, and do not admit of the artist giving clearness and neatness to his work. The soft parts being more easily acted on by the acid, are corroded, and injure the parts of the design with which they have been covered. Stones which have any defect whatever, ought never to be used for the crayon, with which it is necessary to draw with particular care; they are generally used for works in ink. The thickness of stones is immaterial, provided they are not too thin; for in this case, there is a risk of breaking them in the operation of printing. Their thickness ought to be proportioned to their surface. The smallest should not be less than about an inch; when thicker, they have the advantage of serving for a considerable number of designs, but they are very inconvenient when it is desired to remove, or to export them. It sometimes happens, that a stone, the surface of which presents all the qualities which have just been spoken of, and which has succeeded well in the impression of one or more copies, is found to be bad in the succeeding impressions.

The stones proper for lithography are composed of lime, of argil, and of silex. The first of these substances predominates, the third is found in very small quantities. A stone entirely calcareous, does not answer for lithography, as has been proved by the marble of Carrara; crayon, and ink, adhere to this stone with difficulty, and are readily effaced from it; the lines and the shades in a great measure disappear. One of the most certain indications of lithographical properties, is the conchoidal fracture, or that kind of form presented by the fractures of the stone, when broken by the blow of a hammer, which resembles that of a shell. All stones of this kind will be found good, if they are also hard, have all the fineness of grain, and homogeneousness of texture which are necessary.

Of Polishing the Stones.

Polishing is an operation, by means of which, a uniform and flat surface, and a polish more or less high is given to a stone, according to the different kind of design, or of work for which it is intended. The care and precision with which this first preparation of the stone is effected, are not of less importance to the execution of the design, than to that of the impression. A stone, the grain of which is unsuitable for crayons, will not allow the artist to regulate his tints and to give them harmony; when he works in ink, or with the dry point, he will meet with other obstacles, if the polish of the stone be not perfect; and in each case, his drawings will be defective; but they will be much more so, if in the surface of the stone there are undulations, hollows, stripes, &c.

Stones are polished with sand, by rubbing them one on the other. The best sand for this purpose, is that quartoze sand which is fine, and

hard-grained. In Paris, they, in general, make use of a yellow sand which though fine, requires to be sifted. It is necessary to be very careful that the sand which is used be not mixed with gravel, or any sharp angular substance which would form stripes on the stone, the hollows of which would not receive the printing ink, and there would, consequently, be white marks on the impressions. This serious evil is avoided by sifting the sand before it is used, and by rubbing the upper stone slowly, at the commencement of the operation, and occasionally turning it round, upon the lower stone.

The kind of design for which a stone is intended, determines the kind of polish which should be given to it. A work in which crayons are used, cannot be executed unless the stone have a grain left upon it; all other kinds of drawing, require surfaces which have the polish of marble. Whether we wish to employ a fresh stone, or to renew one which has already been used, it must equally undergo the process of polishing. For this purpose it is placed on a table, in the manner to be hereafter described; a little sand is very equally sifted over it, which is moistened with a very little water. On the first stone, is placed a second, as nearly as possible, of the same dimensions, and the upper one is rubbed about, in a direction nearly circular, but drawing it successively towards the four corners, and continually changing the relative position of the stones, so that every part of their surfaces may be subjected to an equal degree of friction. If this be neglected, and the stones be pressed on each other, and the circular motion be always the same, hollows will be formed, and uneven surfaces produced, and these irregularities will show themselves in the impressions. It is easy to ascertain by means of a straight edge, whether the stone be well levelled.

At first the motion should be slow, and the pressure trifling; the rapidity of the one, and the force of the other, increasing as the sand becomes equally distributed. When the sand becomes reduced to a paste, it no longer acts upon the stone; fresh sand must, therefore, be taken until the stone be perfectly smooth, and there no longer remain on it the traces of any former design. The ink which formed this design may have been made to disappear, without our having removed the source of its reproduction. This cause exists in the particles of the fatty substance of the crayon, or of the ink, which have penetrated below the surface of the stone, and which, being again brought in contact with the printing ink, will retain it, and reproduce parts of the old design. It may be known that this cause exists, when it is perceived that on the *wet* stone, there are light traces of the former drawing. It is then necessary to continue the rubbing until these have entirely disappeared. The aqua-fortis employed in the preparation, will, by itself, produce this effect when the traces are very superficial. It should be remarked that of two stones of the same size, the lower becomes polished sooner than the upper one. To avoid this, it is only necessary to change their position.

In order to produce on a stone intended for a drawing in crayons, the grain which it ought to have, it is necessary, after having treated it as we have just described, to sprinkle and rub it again with fine

sand, which by the friction which it produces may be made to give the desired grain. When it is wished to obtain a coarse grain, the stone is rubbed for a less space of time, with the sand, this being also renewed more frequently; but, the rubbing with the same sand is prolonged, when a very fine surface is desired. This rubbing, however, should not be continued too long, or the grain which has been produced, will be destroyed. The state of the grain may be judged of by blowing briskly on the surface of the stone, on which has been placed a little clean water, and then examining its plane, by looking at it in an oblique direction.

When stones intended for drawings in ink, or with other materials, fit for lithography, are to have a very high polish given to them, the procedure is the same as that we have just described, excepting only, that after having produced a fine grain on the surface, the rubbing is continued with the same sand, reduced to a thin paste, taking care to wet the stones when the adhesion between them, becomes so great as to prevent their moving freely. The workman, when he discontinues his labour, should not leave the stones in this state, as they would adhere, and could then be separated only by steeping them in a vessel full of water.

The stones having acquired by the operation described, a certain degree of polish, are well washed, in order to remove the grains of sand, which might produce scratches; a fine polish is then to be given to them by means of pumice-stone. This polishing is effected on one stone at a time, by rubbing it, with a large piece of pumice-stone, after it has been slightly moistened. The rubbing should be in a straight line, sometimes in one direction, and sometimes in the opposite, passing successively over all parts of the surface of the stone. By thus rubbing with the pumice-stone, and the white paste which it produces, only adding water enough to preserve a slight degree of moisture, the beautiful polish of marble is produced. It is afterwards necessary to wash the stone in a considerable quantity of water, rubbing it with the hand, or with a cloth entirely free from grease, and thus to remove any particles of matter, which, by their position on the surface of the stone, would present a substance intermediate between that surface, and the drawing, which would prevent the adhesion of the latter.

Three kinds of grain may be given to stones; the coarse, the middling, and the fine. The first produces designs, the proofs of which have not the finish, and the delicacy, of those which are obtained on the two others. The second ought, in every case, to be preferred; for it possesses all the properties requisite for beauty of execution, although the proofs which it produces have not an appearance quite so soft, and mellow, as those from stones with the finest grain. But these last have the great disadvantage of soon losing the delicacy of the design; of clogging readily; and, consequently, of affording much fewer proofs. In every case it is necessary that the grain should be smooth and uniform, over the whole surface of the stone. Otherwise, the lines traced by the crayon, will be found nearer to each other, or more strongly marked in some places, than in others; the proofs, in

reproducing the same defects, will be found without harmony, and without effect.

When it is intended to execute very beautiful designs, it is necessary to reject the stones which are too soft; those which have hollows; those whose texture is softer in particular spots, than in the general mass; those which are not of an equal thickness, and which have inequalities in their upper or under surface; those, in short, which are not of a good texture, and well polished.

A last precaution, is to preserve the grained, or polished stones, under cover, to protect them from the air and the dust; and not to touch them with the hand, or any greasy substance, on that side which is to be worked on. They are preserved by wrapping them up carefully, in an envelope of white paper.

Specification of a Patent granted to THOMAS LOUD, JUN. *of the firm of Loud & Brothers, of the city of Philadelphia, manufacturers of Piano Fortes, for an improvement in the Horizontal Piano Forte.*

To all to whom these presents shall come be it known, that I, Thomas Loud, Jun. have invented a new and useful improvement in the Horizontal Piano Forte, whereby the tone is greatly improved, the instrument is less subject to get out of tune, and the strings are less liable to break; for which invention and improvement I claim a Patent, according to the laws of the United States.

And I, the said Thomas Loud, Jun. do hereby declare, that the nature of my said invention and improvement, and the manner in which the same may be carried into effect, are fully made known, in the following description or specification.

In the Horizontal Piano Fortes, heretofore made, that part which is technically denominated the *action* is placed below the strings, and the hammers are made to strike upwards, in a direction contrary to that of the support given to the strings by the bridges. In my improved Piano Fortes, I, in general, intend to place the action above the strings, and to cause the hammer to strike downwards, the strings being supported upon bridges in the ordinary way. Sometimes, however, I intend to place the bridges above the strings, attaching them to sufficient supports of wood, or metal, and to place the action below the strings, in the way heretofore practised.

But what I particularly claim as my invention and improvement, is the causing the hammer to strike the strings of horizontal Piano Fortes, in such a way that the direct action of the blow upon the strings, is sustained, and resisted, by the bridges, in consequence of their being situated on the side opposite to the hammers.

Messrs. Loud & Brothers have just completed a Piano Forte, on the plan indicated in their specification, which we have examined, in conjunction with some other persons, well able to judge of the tone, and other qualities of the instrument. It has been a desideratum to give to the Horizontal Piano Forte, the roundness, firmness, and clearness of tone, which distinguishes the best cabinet instruments:

this bell-like, or glassy, effect, is produced in a very high degree by the arrangement adopted by the Messrs. Loud. The action in this Piano is below the strings, as is usual in those of a similar form; but the bridge, or support, is inverted, being placed above the strings; this arrangement possesses the advantage of greater simplicity in the action, than is possible in the other method proposed by the patentees, that is, the placing the action above, and the bridges, or supports, below the strings. We are convinced, however, that in this latter mode, the frequent breaking of the strings will be prevented, and that the instrument will stand much longer in tune than any other of the horizontal kind; our reason for this conviction is that the effect of the blow of the hammer, in its tendency to break or lengthen the strings, will be counteracted by the supports, or bridges, on their opposite sides. EDITOR.

On the Strength of American manufactured Gun Powder.

A NEAT duodecimo volume, entitled "THE AMERICAN SHOOTER'S MANUAL, *By a Gentleman of Philadelphia County,*" has just issued from the press of Carey, Lea & Carey. We know but little, experimentally, of "the dog and gun," but have no doubt that the Manual will be a very acceptable auxiliary to those who are fond of the sports of the field, as it is specially adapted to this pursuit in our own country. The plates do great credit to the artists; they are characteristic, and well executed. We did not, however, sit down to write a Review, but merely to make an extract from that portion of the book, which treats of Gunpowder, as it evinces the superiority of that made in our own neighbourhood.

"*Gunpowder.*

"Powder to be good, should be quick, strong, free from impurity, and not liable to attract moisture from the atmosphere. The general method of trying the purity of powder, is by burning it on clean white paper; two or three small heaps are made, near each other, and one of them is fired; if the smoke rises perpendicularly, and there be no feculent matter left on the paper, nor the other heaps fired, it is considered as evidence that the ingredients have been of a good quality, and well compounded. If, however, the other heaps are fired, the paper burnt, or a dirty residuum left, it may be supposed, that the nitre was impure, that the charcoal was not completely pulverized, or the whole of them, were not well incorporated together. It is remarkable, that powder will vary in its proof at different times of the day, and from what cause, we know not, in truth, notwithstanding it has been in use for four hundred years, we are still but partially acquainted with the nature and properties of this article.

"Several methods of proving, or trying the strength of powder, have been adopted, but with the exception perhaps, of Mr. Dupont's Eprovette, none of them can be relied on for much accuracy, when used for fine powder.—The mortar is very uncertain, and the spring Eprovette is worse than useless, and should be abolished.

"I shall conclude this subject, by inserting a communication, made by Captain Thomas J. Baird, of the U. S. Army, on ordnance duty; in which a detail of a number of experiments, on powder from different manufactories, were kindly made by him, at my request. I was well aware, that many partialities existed, in favour of foreign powder, and prejudice was against our own; it was therefore considered adviseable to have a fair and impartial trial given to both, by some person, whose profession and character, would silence every suspicion of unfairness, or partiality; and the public may rest assured, that the following is a true and honest report of every result."

"ARSENAL, FRANKFORD, APRIL 24, 1827.

"*To the Author of the "American Shooter's Manual."*

"MY DEAR SIR—

"It is with much pride and satisfaction I communicate to you, the result of a series of experiments, made upon several samples of powder with which you furnished me, for that purpose, together with that manufactured by Messrs. Dupont de Nemours & Co. of Brandywine.

"I say that I am proud to communicate these results, not only because they fully prove, that *our* powder is the best in the world, but they enable me to do justice to the manufacturers; who from their care and enterprise, have not only been able to compete with, but have actually, in a few years, outdone all Europe, in this important article. This is a pretty bold assertion, but it is nevertheless true.

"I speak without prejudice, and although I have invariably given the preference to domestic articles, when of as good a quality, and at as reasonable prices as foreign, still I have never boasted of so much patriotism, as to give a high price for an inferior article, because made at home.

"There is certainly no nation in the world, whose manufactures, in general, have so justly become celebrated, as Great Britain, and in no article, perhaps, more than in gunpowder.—The French powder has been highly spoken of, but by experiments made upon what is called "*King's Powder*," made expressly for the King of France and his court, and which is doubtless the best made in France, it has been found not to bear comparison with that of Pegou, Andrews & Wilkes, which is no doubt the best foreign powder ever introduced into this country.

"The annexed table, will show the result of the experiments, which were made upon an improved Eprovette, for the proof of fine sporting powder. This Eprovette, is nothing more than a small chamber capable of containing about the charge for a patent breech fowling piece, placed in a vertical position; so, that the action of the powder, is upwards: when loaded, a weight of about four pounds, attached to a lever, is let down so as to cover the chamber. To the moveable end of the lever, a graduated riband is so attached, that when explosion takes place, the weight is thrown up, taking with it the riband, which passes through a small slide; the weight, of course, again falls to its place, but the riband is held by the slide, at the point to which the force of the powder carried the weight.

TABLE.

DESCRIPTION OF POWDER.	1st range in degrees.	2d range in degrees.	3d range in degrees.	Mean range in degrees.	Remarks.
Pegou, Andrews, & Wilkes' single seal.	82	81	82	82	
do. do. double seal.	95	84	95	91	
do. do. Canister,	110	105	105	107	
Edinburgh.	93	93	93	93	
London.*	78	82	82	81	
Dupont de Nemours, & Co.	112	115	110	115	Being 8 degrees stronger than Pegou, Andrews & Wilkes' Canister.

By this it will be seen, that Dupont's powder is eight degrees stronger than the best sample of foreign, namely Pegou, Andrews & Wilkes'.

Having tested the strength, I shall now proceed to show the quickness of the different samples, as proved by a machine invented by Mr. A. Dupont. The manner of testing quickness, upon this machine, is both simple, and satisfactory. It is nothing more, than burning a train of twelve feet, or one hundred and forty-four inches, of each of the two samples to be tried; these trains are laid parallel to each other, and the board being graduated, you see plainly the compara tive quickness of each sample. The following, is the result of these experiments; Dupont taken as the standard, one hundred and forty-four.

TABLE.

DESCRIPTION OF POWDER.	Inches.	DESCRIPTION OF POWDER.	Inches.	Difference in favour of Dupont's. Inches.
Dupont's	144	Pegou, Andrews & Wilkes' double seal.	96	48
Dupont's	144	do. do. Canister.	103	41
Dupont's	144	Edinburgh.	128	16
Dupont's	144	London.	102	42

By this it will be seen, that there exists a still greater difference in favour of Dupont's powder, over the foreign, in point of quickness, than in that of strength. When we consider the difference between one hundred and forty-four, and one hundred and three, we perceive that Dupont's powder burns nearly one third faster, than Pegou, Andrews & Wilkes' justly celebrated canister. The Edinburgh powder, comes nearest Dupont's, in point of quickness, burning as one hundred and twenty-eight, to one hundred and forty-four, making a difference of one ninth, in favour of Dupont's; although it falls short of Pegou, Andrews & Wilkes', in strength.

I must also remark, that the residuum, in burning all these powders, is much greater than in Dupont's, consequently, the latter also possesses the quality of cleanliness in a greater degree than the others.

Having now given you the result of those experiments, without favour, or prejudice, and merely that your book might contain such information, as would put it in the power of any one to select the

* That called London powder is said to be an inferior quality of the Edinburgh.

best powder, I will only add, that I hope and trust, every sportsman, who believes in the authority of this statement, and who yet purchases foreign powder, will, at least, have the candour to acknowledge, that it is from prejudice, and not from judgment, that he prefers it.

With much esteem,

I am your obedient servant,

T. J. B.

Notice of a new mode of purifying Gas from Coal.

[To the Editor of the London Journal of Arts.]

Sir,—A patent having been recently granted to me for purifying coal-gas, by means not hitherto used for that purpose, (and knowing your readiness to give early publicity to every new invention,) without waiting until my specification shall be enrolled, I take the liberty of addressing to you this communication, which you will notice, or reject, as you may think proper.

It would be superfluous to trouble you with the details of gas-making, I will only remind you with regard to the purification, that it has always been an offensive and complicated process, conducted at an expense of from three-pence, to a shilling, per 1000 feet, according to the local price of lime, of which many hundred tons are annually required in a large work, producing a most inconvenient accumulation of refuse.

In the wet system, the vast quantity of lime-water employed, and the difficulty of disposing of it afterwards, are obvious objections, exceeded only by those of the dry system, which occupies more labourers, injures their health, wastes a great deal of gas at each change of the lime, whilst without the most unremitting superintendence, the quality of the gas will either be impoverished by the purification, or become infamously bad.

The greatest inconvenience of the present methods, next to the lime heap, is the ammoniacal liquor, produced by thousands of gallons in large works; which, if not evaporated, is usually either carted away with the ashes, or allowed to flow into the adjacent roads and drains; in both cases, to the great annoyance of the public.

By my new patent process—1st. All these nuisances are effectually removed. 2nd. The expense is materially diminished. 3d. The ammoniacal liquor is manufactured into an alkali far superior in effect to lime, and less than a fiftieth part of its bulk.

I have only to add, in explanation, that I pass the coal-gas from the condenser, simultaneously with a stream of ammoniacal gas, into a common receiver, and thence through water into the gasometer.

I have practised this method on a large scale, at the works of the Birmingham and Staffordshire Company, with complete success. The apparatus is simple and cheap, the labour scarcely any, and the gas is very white, with great illuminating power. As little or no

alteration will be necessary in works already established, I entertain no doubt of its general adoption.

I am, sir,

Your obedient servant,

J. F. LEDSHAM.

Edgbaston, near Birmingham, April 20, 1827.

French Patents, granted in the third quarter of 1826.

To J. C. M. Baron, Paris, for a new construction of baking ovens —10 years.

Count Lammartiziere, Paris, for a mechanism to propel boats against the stream—10 years.

Th. Hipert, Montpellier, for a process to draw and spin silk—10 years.

J. M. Lepetou, Paris, for an ingredient to destroy bugs—5 years.

B. Large, Lyons, for a system of boilers for steam engines—15 years.

G. and M. Diddman, Strasbourg, for a horizontal bobbin, with a vertical pressure, to be employed in spinning machinery—15 years.

P. C. Chevedu, Paris, for a new billiard table—5 years.

E. N. Favreau, Paris, for a hydraulic power applicable to factories—15 years.

V. E. Guilleaume, Paris, for improvement to M. Laforesi's hemp and flax break—5 years.

J. Nicholson, Paris, for an apparatus of portable gas—15 years.

Moses Poole, London, for a composition imitating gold—15 years.

Moses Poole, London, for a process to decorate "in relief"—15 years.

L. H. Truffant, Paris, for a mechanical inkstand—10 years.

Belanger, St. Leger, father and son, for a clearing cylinder for carding engines—10 years.

L. P. Fournier, Paris, for children's bolster caps—5 years.

J. B. Souton, Rouen, for a washing apparatus to cleanse wool—10 years.

Arnaud, Fournier and Westermann, Paris, for a system of machinery to comb, prepare, and spin, long wool—10 years.

N. A. Mercier, Louviers, for a conical motion to carry up the carriage in spinning mules—5 years.

J. Ganahl, North America, for a rotative steam-engine—15 years.

C. A. Thiselton, London, for a locomotion to propel carriages—10 years.

B. L. Berthaut, Paris, for printing rollers with slots and nibs—5 years.

H. Pellicat, Paris, for a power-loom—15 years.

P. E. Kinkalla, Paris, for a system of navigation—15 years.

M. P. Guersaut, Caen, for a process of manufacturing, at the same time, lace, and embroidery—5 years.

LIST OF PATENTS IN ENGLAND.

Which passed the Great Seal, in December, 1826, and in January and February, 1827.

To Thomas Morrison, Esq. for his invention of a method or process of rendering boots, shoes, and other articles, water-proof—Sealed 22d December.

To David Redmund, Engineer, for his invention of certain improvements in the construction and manufacture of hinges—22d December.

To Elijah Galloway, Engineer, for his invention of an improved rotatory steam-engine—29th December.

January, 1827.

To John Whiting, Architect, for his invention of certain improvements in window sashes and frames—9th January.

To James Frazer, Engineer, for his having invented an improved method of constructing capstans and windlasses—11th January.

To James Frazer, Engineer, for his having invented an improved method of constructing boilers for steam-engines—11th January.

To William Wilmot Hall, of the city of Baltimore, in the United States of America, at present residing in the city of Westminster, in the county of Middlesex, Attorney at Law, in consequence of a communication made to him from a foreigner residing abroad, for a new invention of an engine for moving and propelling ships, boats, carriages, mills, and machinery of every kind—15th January.

To William Hobson, gentleman, for his new invented improved method of paving streets, lanes, roads, and carriage-ways in general —15th January.

To James Neville, Engineer, for his new invented improved carriage, to be worked or propelled by means of steam—15th January.

To William Mason, patent axle-tree maker, for his invention of certain improvements in the construction of those axle-trees and boxes for carriages, which are usually termed or known by the names of mail axle-trees and boxes—15th January.

To Robert Copland, gentleman, for his invention of certain improvements upon a patent already obtained by him for gaining power —16th January.

February, 1827.

To Robert Barlow, for a new combination of machinery, or new motion for superseding the necessity of the ordinary crank in steam-engines, &c.—1st February.

To John Frederick Daniel, Esq., for improvements in the manufacture of gas—1st February.

To John Oldham, of the city of Dublin, gentleman, for improvements in the construction of wheels designed for driving machinery, which are to be impelled by water or by wind, and which said improvements are also applicable to propelling boats and other vessels—1st February.

To Ralph Hindmarsh, master mariner, for an improvement in the construction of capstans and windlasses—1st February.

To Robert Stirling Clerk, minister of Galston, in Ayrshire, North Britain, and James Stirling, Engineer, in Glasgow, Lanarkshire, North Britain, for certain improvements in air engines for moving of machinery—1st February.

To John White, of Hants, Engineer and iron founder, for improvements in the construction of pistons or buckets for pumps—1st February.

To Samuel Parker, bronzist, for improvements in the construction of lamps—1st February.

To Antoine Adolphe Mariellan Marbott, merchant, in consequence of a communication made to him by a certain foreigner residing abroad, with whom he is connected, for an invention of certain improved machinery, for working or cutting wood into all kinds of mouldings, rebates, cornices, or any sort of fluted work—3d February.

To Sir William Congreve, Baronet, for his having invented a new motive power—8th February.

To William Stratton, Engineer, for an improved apparatus for heating air by means of steam—12th February.

To John George Christ, gentleman, in consequence of a communication made to him by a certain foreigner residing abroad, for certain improvements in copper, and other, plate printing—14th February.

To Philip Jacob Heisch, of America-square, in the city of London, merchant, in consequence of a communication made to him by a certain foreigner residing abroad, with whom he is connected, for certain improved machinery for spinning cotton—20th February.

To Charles Barwell Coles, Esq. and William Nicholson, Civil Engineer, in consequence of a communication made to them by a certain person residing abroad, for a certain invention or new method of constructing gasometers, or machines or apparatus for holding and distributing gas, for the purpose of illumination—20th February.

To William Benecke, gentleman, in consequence of a communication made to him, by M. William Pescatore, a foreigner residing at Luxemburgh, in the kingdom of the Netherlands, (on whose behalf this patent is taken,) for an invention of a machine for grinding or crushing seeds, and other oleaginous substances, for the purpose of extracting oil therefrom—20th February.

To William Jefferies, of Middlesex, brass manufacturer, for his invention of certain improvements in calcining, or roasting and smelting, or extracting metals and semi-metals, from various kinds of ores, and matters containing metals or semi-metals—20th February.

To Pierre Erard, musical instrument maker, in consequence of communications made to him by a certain foreigner, residing abroad, and discovered by himself, for an invention of certain improvements in the construction of piano-fortes—20th February.

To Augustus Count de la Garde, in consequence of a communication made to him by a certain foreigner residing abroad, for a method of making paper, of various descriptions, from the bullen, or ligneous parts, produced from certain textile plants; in the process of preparing the same textile plants, by the Rural mechanical brake, (for the exclusive use of which he has already applied for a patent,) and

which substances are to be employed alone, or mixed with other suitable materials, in the manufacture of paper—20th February.

To William Smith, of Sheffield, merchant, for his improved method of manufacturing cutlery, and other articles of hardware, with the means of rollers—20th February.

List of Patents granted in the United States, in November and December, 1826.

FOR INVENTIONS AND IMPROVEMENTS.

In a set auger, for boring hubs or naves of wheels; Sheldon Cadwell, Windham, Conn't., Nov. 20.

In the construction of furnaces for anthracite coal; Wm. Church, Boston, Mass., Nov. 20.

In the machine for pressing cotton; Jas. Boatwright and Jas. Nathans, Richland, S. Carolina, Nov. 21.

In the umbrella and parasol; William Sleeper, Philadelphia, Nov. 22.

In making saddle trees, George Wilkes, Fredonia, Indiana, Nov. 22.

In a spinning machine, called the domestic spinner, Lafferred Totten, Schoharie, N. York, Nov. 22.

In fire arms, Fordyce Ruggles, Hardwick, Mass., Nov. 24.

In the washing machine, Burroughs Beach, New Milford, Conn't., Nov. 24.

In the application of the screw in propelling machinery; Wm. H. Godfrey, Rochester, N. York, Nov. 27.

In the locomotive steam saw mill, W. G. Berry and J. T. Osborn, Cincinnati, Ohio, Nov. 22.

In the grate and blower for Lehigh coal, S. C. Mott and W. Holmes, New-York, Nov. 26.

In the mode of making clay pipes; John Bower, East Bethlehem, Penn., Dec. 1.

In the mode of spinning wool, cotton, &c.; Seth Boyden, Foxborough, Mass., Dec. 7.

In the dairy cooler; David Witmer, Paradise, Penn., Dec. 7.

In the manufacture of silver spoons, &c.; William Gale, New-York, Dec. 7.

In the washing machine; David G. Dunham, New Brunswick, N. J., Dec. 7.

In the mode of propelling the cotton gin; Peter Knox, Augusta, Georgia, Dec. 7.

In the trip hammer; Philip Petts Read, Mercer, Maine, Dec. 7.

In a self-feeding brick press; John Winslow, Portland, Maine, Dec. 8.

In the circular re-acting saw; William Avery, Cazenovia, New York, Dec. 8.

In the paddle wheel for propelling boats; Wm. F. Kearsing, New York, Dec. 8.

In distilling all kinds of liquor; Norman and Anson Wolcott, Bloomfield, N. York, Dec. 8.

In the mode of sawing veneers, &c.; John P. Atten, Manchester, Mass., Dec. 8.

In the thrashing machine; James Hyde, Pembroke, N. York, Dec. 9.

In the mode of propelling boats and vessels; John James Girard, Baltimore, Dec. 12.

In the mode of manufacturing wool, &c.; John Goulding, Dedham, Mass., Dec. 15.

In the kiln for drying and curing tobacco; Edmund Pendleton, Louisa County, Vir., Dec. 18.

In the machine for pressing cheese, cider, &c.; Lebbeus Caswell, Harrison, Maine, Dec. 18.

In the machine for breaking hides; Hezekiah S. Clark, Randolph county, N. C., Dec. 22.

In the machine for manufacturing slate; J. M. Porter & P. S. Maltes, Easton, Penn., Dec. 22.

In the mode of drawing lotteries; John C. Rives, Washington, D. C., Dec. 22.

In the machine for planing boards; Herman Atten, ********** Dec. 22.

In the machine for planting cotton, corn, &c.; John Lobdell, Warren county, Mis., Dec. 26.

In heating and boiling water, &c.; George J. Payne, Lockport, N. York, Dec. 27.

In the machine for pressing and packing cotton; James H. M'Clelland, Fairfield District, S. C., Dec. 28.

In the machine for making the hubs of wheels; Isaac Willbur, Madison, N. York, Dec. 28.

In a revolving timber plane; Daniel N. Smith, Warwick, Mass., Dec. 28.

In the marine rail way; Richard Ward, N. York, Dec. 28.

In making hats by the application of steam; William Harkins, Wheeling, Virginia, Dec. 29.

In the machine for spinning wool, cotton, &c.; Seth Boyden, Foxborough, Mass., Dec. 29.

In the pendulum motion for machinery; Justin Jacob, Montreal, Canada, Dec. 29.

In the evolution and management of heat; Eliphalet Nott, Schenectady, N. York, Dec. 29.

In bedsteads; Samuel Davis, Catskill, N. York, Dec. 29.

In the construction of fire-places, furnaces, &c.; John W. Bott and Wm. Lyman, Boston, Dec. 29.

In the lithontriptor; Isaiah Lukens, Philadelphia, Dec. 30.

In the machine for grating corn, apples, &c.; Camm Moore, Guilford county, N. C., Dec. 30.

In a revolving coal sifter; Thomas Borbidge and Anson Martin, Kingston Township, Penn.

In the machine for pressing hay, cotton, &c.; David Flagg and Charles Peck, Gardiner, Maine.

NOTICES.

Debts and Credits.

The Edinburgh Journal of Science, for April, has copied from Newton's Journal, a method of producing a fine black colour, originally published in this Journal, with remarks by the editor. In this last version of the article, all traces of the Franklin Journal are lost, and the remarks of its editor, attributed to Mr. Newton, by name. We attach no great importance to the article in question, nor do we suspect, that the change in its aspect has arisen from design, but entirely from inadvertence; still we are tenacious on this point, as from the state of things in this country, and in Europe, we draw largely upon their stores of information, contributing but little in return, and are therefore less willing to be deprived of our 'one talent.'

Under this head, we will also remind our subscribers, that the subscription for the present year, is now due.

Professor CLEVELAND'S *Mineralogy.*

Professor Cleveland, is now engaged in preparing for the press, another edition of his Mineralogy, in which the state of this Science, at the time of the publication of the work, will be exhibited, as far as may be practicable.

"*Upward Forces of Fluids.*" In the last number of Dr. Silliman's Journal, Mr. Genet has replied to, or rather noticed, our remarks upon this subject, in our January number. He shall hear from us again in our next, and also, through the medium of Dr. Silliman's Journal.

To Correspondents.—In our last number, we offered an apology to some of our correspondents, whose communications were delayed, on account of the engravings; these were to be executed by an artist residing out of the city; a gentleman, to whose care they were entrusted, lost the trunk in which they were contained, and it has not yet been recovered. We must depend upon the gentlemen who furnished the articles, to favour us with fresh drawings, as the originals were in the lost packet. The drawing and description of Mr. Malin's furnace, for smelting iron with anthracite; Mr. Stott's canal boats, and Colonel Long's steam engine furnace, were among the 'missing.'

Dr. Fearn's ingenious mode of applying a compensation rod to a pendulum, could not be engraved in time for this number.

The essay on Centrifugal force, by T. W. Bakewell, has come to hand, and shall appear in our next.

The report of the Franklin Institute, upon the Anémotrope of M. Biard, of Paris, should have appeared this month, but we have an engraving of it in progress, which will render the report more clear, and acceptable; and we have, therefore, determined to let them accompany each other. The model presented by M. Biard, has been deposited among those of the Institute.